

UNIVERSITY OF OSLO

Department of Informatics

**Challenges of Health Information Systems
Programs in Developing Countries:
Success and Failure**

**The cases of Thua Thien Hue province
and HoChiMinh city, Vietnam.**

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Master thesis

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The thesis has been supervised by:

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To my family, friends...

Summary

This thesis examines the challenges of introducing Health Information Systems in Developing Countries, with special focus on the success and failure of two Vietnamese projects (Thua Thien Hue Province and Ho Chi Minh City). The project of Thua Thien Hue Province (TT Hue) – from 2004 to 2008 – and that of Ho Chi Minh City (HCM City) – in 2008 – are analyzed using Gaps and Gap Closure Techniques (Heeks et al., 1999).

The method applied is the Action Research Approach and the focus is on the two following research questions:

1. What are the challenges of developing and implementing a Health Information System in Vietnam (2004-2008)?
2. Why did the implementation of DHIS not succeed in the TT Hue Province (2004-2008)? A comparison of the cases of TT Hue Province and HCM City.

After two years of experience and four months of fieldwork in Vietnam, where I was a facilitator and an intern student of HISP, I became involved in the local Vietnamese HISP team developing and implementing three different versions of DHIS (1.3, 1.4, and 2.0) in cooperation with the global HISP team.

The findings presented are consistent with the Seven Gaps and Gap Closure Techniques and consist in a detailed discussion of the challenges of developing and implementing a Health Information System.

The solutions proposed result from a critical examination of the projects, with reference to contributing factors such as the health report system, the technological capabilities and limitations of the DHIS software, Implementation strategy, Infrastructure, Staff skills, Managerial inadequacies, Communication and cooperation, and Policy monitoring of the local team by the global organization. The lessons learned from the cases of the TT Hue Province and HCM City have also been included.

The thesis aims at explaining why some Health Information System projects in developing countries meet with either success or failure; in this case, why the two specific Vietnamese projects failed. Given the limited time allotted to the thesis in the Master's Programme - one year, including fieldwork and writing – the thesis cannot cover all aspects of the topic and is therefore not exhaustive. A further understanding of the challenges would need additional studies from a greater range of countries.

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Oslo,

Kim Anh Thi Vo

June 2009

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Chapter 1: Introduction

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- 1.1. Motivation
 - 1.2. Research focus and research questions
 - 1.3. Organization of the chapters
-

1.1. Motivation

This section presents the story briefly about the way leading me to be involved with HISP and about my field work in Vietnam in the summer 2008.

The thesis is the story of how I came to examine my case of TT Hue province and subsequently the HCM city project. In 2004 when HISP [Health Information System Programme] emerged as the very first steps toward the implementation of DHIS [District Health Information System], it was supposed to be an application for District Health Care Units to collect and analysis the statistical data and information in Vietnam. The story is told from the viewpoint of someone who is both an insider and an outsider. The story covers the HISP project in TT Hue province, and during the fieldwork in HCM city carried out in the summer in 2008.

In the late 2004, I was involved in HISP as an inter-student pursuing a Bachelor's Degree at Hue college of Sciences. After I graduated in June 2005, I was hired on a two-year contract and worked for TT Hue province as a facilitator to support the implementation of both DHIS1.4 and DHIS2.0. I then came to Norway to pursue the second year towards my Master's Degree at the University of Oslo as a Quota Scheme student. I feel that someone with my background will be able to depict the story of the projects with accuracy.

For more than two years, from 2005 to 2007, I worked for HISP in Vietnam as a local facilitator and support for the implementation process. I was in charge of training the end users in the pilot districts. I therefore have first-hand knowledge of the implementation, training, and operation of the DHIS systems (DHIS1.3, 1.4, and 2.0), and of the cooperation between local, national and global teams.

My ambition in life has been to learn and experience as much as I can, to enjoy life, and to prove myself and seek challenges. Applying for the Master's Program at IFI- Institutt for informatikk at UiO provided me with the opportunity to explore the educational system of Norway, a country with a modern student environment.

I have been very pleased with my new environment: school, teachers, friends, classmates, flat mates, etc. However, the main things have been the knowledge and experience that I have been able to garner from the various courses, fellow students, and teachers; all of which have been invaluable to me both academically and socially.

The experience I acquired from the years at the College in Hue City, and the work I performed as a member of the HISP team in Vietnam, implementing a HIS/HMIS scheme by introducing DHIS software, was the main motivation behind my fieldwork in Vietnam during the 3rd semester of the Master's Program.

I gathered much of the information about the HISP project in HCM City from the team via emails and websites, and I was delighted to work with a strong seven-member team including people from a variety of fields: health management, health professionals, developers, facilitators, etc.

The main concern was to focus on the topic/field that I would work on. After talking with the coordinators of HISP in Vietnam, I prepared my own proposal for a thesis about *exploring the usefulness of a HIS/HMIS for the locals* by customizing Open Health [OH] (a system that supports the planning, management and monitoring of public health programmes) for DHIS2 in HCM City. I was eager to start working in the field as soon as I came back to Vietnam in late June 2008.

1.2. Research focus and research questions

My fieldwork did not start out the way I planned in HCM city, but I still got invaluable experience from the work, especially through the organization, socialization and problem-solving, as well as through the training/guiding of the members of the new local team.

My research focus changed because of what I learned. And I was still keen to go on. The local team has had the challenging tasks of building and maintaining itself.

HISP is an international organization with the following main activities: the implementation of health information systems, their assessment and evaluation. While the academic work can take place in universities, the implementation process must be carried out in the field. The work of the local teams is crucial. And it is increasingly indispensable to build and maintain these teams for future studies and for the assessment of HISP projects.

Based upon the factors outlined above, my thesis will address the following two main questions:

1. What are the challenges of developing and implementing a Health Information System in Vietnam (2004-2008)?
2. Why did the implementation of DHIS fail in the TT Hue Province (2004-2008)? A comparison of the cases of TT Hue Province and HCM City.

1.3. Organization of the chapters

The thesis consists of six chapters. From the second chapter on, the chapters contain the following:

Chapter 2: Research settings and background

This chapter presents the research setting and the background as an introduction to HISP – Health Information Systems Programme, DHIS – District Health Information Systems, and to Vietnam, and includes the information relevant to the main focus of the thesis. This gives the readers a greater understanding of the HISP missions, the functionalities of the DHIS, and of course the story of HISP (or DHIS) in the specific context of Vietnam.

Chapter 3: Literature Preview

Development and Implementation of an HMIS-Health Management Information System within the context of Success and Failure are the main focus in this chapter. The concepts of

the Seven gaps and Gap Closure Techniques (GCT) are presented as the main literature of the thesis.

Chapter 4: Methods

Action research is the approach of methodology with qualitative methods: Field-based Observations, Interviews, Meetings, and Document analysis.

Chapter 5: Discussion

The analysis of the projects in particular and the discussion of the lessons learned in general are the main focuses of this chapter. The cases of HISP in Vietnam are discussed with the Seven gaps and Gap Closure Techniques.

Chapter 6: Conclusion

The conclusion contains my closing arguments and an assessment of my study's contribution to the implementation and management of DHIS software on a local level in Vietnam.

Chapter 2: Research settings and Background

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- 2.1. HISP - Health Information Systems Programme
 - 2.1.1. An overview of HISP
 - 2.1.2. HISP: an international organization
 - 2.2. DHIS - District Health Information System software
 - 2.3. The context of Vietnam
 - 2.3.1. The Socialist Republic of Vietnam
 - 2.3.2. TT Hue province
 - 2.3.3. HCM city
 - 2.3.4. The Health Information System in Vietnam
 - 2.3.5. HISP and Vietnam
-

2.1. HISP - Health Information System Programme

2.1.1. An overview of HISP

HISP project is short for **Health Information System Program** and it is an action research project with other missions such as: education, research and development. In cooperation with universities around the world, especially in developing countries, HISP's mission is to put in place sustainable and flexible Health Information Systems that meet the needs of the local populations.

HISP started in South Africa in 1994 and DHIS software (District Health Information System) was first developed in 1998. So far, HISP has been expanded to many other countries in Africa and Asia. The HISP network includes universities, Ministries of Health, NGOs, and companies. The resources of HISP (ICT solutions, materials, and experiences) are shared based on Free and Open Source Software principles. The focus of HISP is to develop and implement an integrated Health Management Information Systems for routine-data, semi-permanent data, and survey data.

The DHIS software has been customized and translated into many languages, such as, Portuguese, Swahili, Spanish, Telugu, Russian, Mongolian, French, Chinese, and Vietnamese.

About 70% of HISP activities are training for health workers and health managers (Source: <http://www.hisp.org>)

2.1.2. HISP: an international organization

Active in many countries, HISP is an international organization which encourages the governments of developing countries to develop Health Information Systems adapted to their needs in an effort to bring them up to par with developed countries.

HISP has been active for more than 15 years, and many developing countries can learn from the experience of sustainable and flexible health systems introduced elsewhere. It is also necessary for developing countries to explore the roles, influences, and relations between the global, the local, and the field levels.

In order to emphasize the role of the field, I suggest the third element (while the other two are global and local): the field when mentioning about the relationships and the roles relating to develop and implement a HIS.

The reason is that HISP, as an international organization, operates with the two levels: the global and the local. However, HISP's mission is to find optimal ways to implement Health Information Systems in the field. Hence, the *field* level and its modus operandi become the essential factors for the field teams. While both the international and the local divisions mainly orchestrate human resources and technology, the field teams manage the complex relations between people, technology, policies, social factors, culture, language, habits, customs, etc.

2.2. DHIS - District Health Information System software

The DHIS software has three versions that can be used with two different environments: DHIS1.3 and DHIS1.4 with Windows and DHIS2.0 with Java. There are many differences between the versions, such as data structure (function-oriented and object-oriented), technology (closed and open-source), design (desktop and web application), etc. However, the main mission of HISP – to improve the health information systems by supporting communities, health care workers and decision makers – has been maintained.

The different versions of the DHIS will be introduced in the following:

DHIS 1.3

DHIS is developed by HISP to support for reporting and analyzing health data and information. The main functionality of DHIS 1.3 is generating reports after the users enter data for the data elements and indicators aggregated. DHIS 1.3 is a desktop application and installed on the single computer at the pilot districts. Maintenance is very challenging for DHIS 1.3 because of fragments of the data file at the districts when collecting and collating the data file for the province.

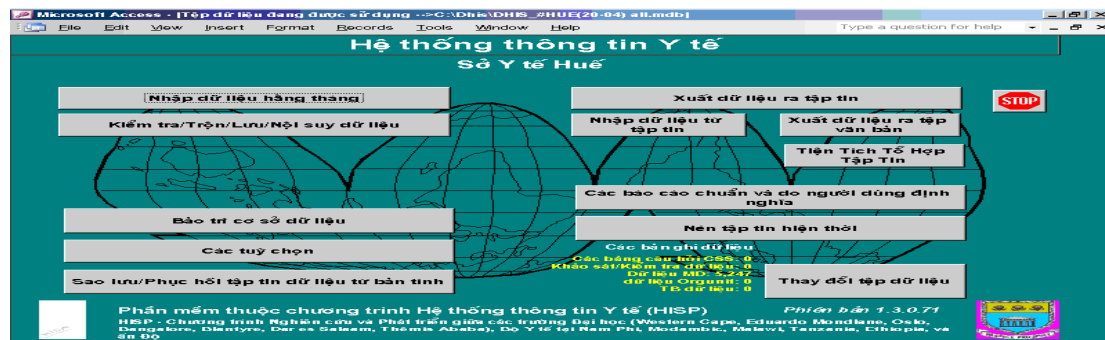


Figure 2.2a: DHIS1.3 in Vietnam (Vo, 2005)

DHIS1.3 and DHIS1.4 are developed under Microsoft Access of Microsoft Office (MS Office) package with the core modules with Visual Basic language and these versions can support for the statistical tasks and analyses. The main differences between the two are the structure of the database, the 1.4 version being lighter and more structured-based than the 1.3. Also, the GUI-Graphic User Interface of the 1.4 version is much more user-friendly than the 1.3. But when the 1.3 version was piloted in Vietnam context, many issues arose because MS Office did not support fully Vietnamese characters and the report systems in Vietnam were too complicated for the software, its design and technology.

DHIS 2.0



Figure 2.2b: DHIS2 in Vietnam (updated March 2009) with Report services are active

This is the core of the DHIS2.0 web application. Although it does not yet support as many functionalities as the previous versions, open source technology and web application are the promise of the project. Needless to say, the benefits of web applications are great compared with traditional desktop applications. However, the interaction between the developers, the users, and the infrastructures pose certain challenges.

The DHIS2 technologies comprise: The Spring Framework, Hibernate, Web Work, Maven, and Junit (see more at: hisp.info). The core modules of DHIS 2 are: `dhis-api`, `dhis-services`, `dhis-support`, and other core modules. Also there are the web modules, such as `dhis-web-commons`, services functionality modules, `dhis-web-maintenance`, and `dhis-web-portal`.

The design and the technology of DHIS 2 are advanced and improved to make DHIS more user-friendly. The system performance has also been enhanced and the DHIS 2 can be run on any computer platform, such as Windows, Linux, and Mac with a Java-based web application.

2.3. The context of Vietnam

2.3.1. The Socialist Republic of Vietnam



Figure 2.4.1: Vietnam profile

(Source: <http://en.wikipedia.org/wiki/Vietnam>)

Vietnam is a Socialist Republic with more than 86 million people. It is the 13th most populous country in the world.

The people of Vietnam gained independence from China in AD 938 after the Bạch Đằng River victory. In the mid-19th century, Vietnam was colonized by the French, and in the mid-20th century, the nation was divided politically into two countries. The two sides fought each other during the Vietnam War, which ended with a Communist victory in 1975.

In 1986, Vietnam instituted economic and political reforms and initiated international reintegration. By 2000, Vietnam had established diplomatic relations with most nations. And its economic growth had been among the highest in the world in the past decade. In 2007, Vietnam was invited to join World Trade Organization. Vietnam became a non-permanent member of the United Nations Security Council in 2008.

Vietnam has 58 provinces and five centrally-controlled municipalities existing at the same level as provinces. The provinces are subdivided into provincial municipalities, townships and counties, and then, subdivided into towns, or communes. The centrally-controlled municipalities are subdivided into districts and counties, and then, subdivided into wards.

2.3.2. TT Hue province with the royal capital, Hue city



Figure 2.3.2: Theater at the Citadel on Hue, the Palace of the Kings

Thua Thien Hue province is a province in the North Central Coast of Vietnam. Hue city, the capital of the province, was once the royal capital of Vietnam. There is an extensive complex of imperial tombs and temples.

Before 1975, the province was known as Thua Thien. The province was subjected to heavy fighting during the Vietnam War. More U.S soldiers died in this province than in any other province in Vietnam.

Thua Thien Hue is divided into eight districts: A Lưới, Hương Thủy, Hương Trà, Nam Đông, Phong Điền, Phú Lộc, Phú Vang, and Quảng Điền. The capital city of Hue is a municipality.

Hue City is one of the most important education centers in Vietnam with Hue University composed of Hue Economic University, Hue Medical University, Hue Pedagogical University, Hue Forestry and Agriculture University, Hue University of Sciences, Hue University of Arts, Hue Conservatory of Music. Quoc Hoc high school in Hue is one of the famous schools in Vietnam.

2.3.3. Hochiminh city, the busiest and most crowded city of Vietnam



Figure 2.3.3. A corner of HCM city in front of Mother and Child Health Care Center

(Taken 29/10/08)

Ho Chi Minh City (or HCM City) is the largest city in Vietnam. Before 17th century, it was the main port of Cambodia. Under the name Saigon, it was the capital of the French colony of Cochinchina and later of the independent state of South Vietnam from 1954 to 1975. In 1976, Saigon merged with the Gia Định province and was officially renamed Hồ Chí Minh City.

The city is located on the banks of the Saigon River, 60 kilometers (37 miles) from the South China Sea and 1,760 kilometers (1,094 miles) south of Hanoi, the capital of Vietnam.

The metropolitan agglomerations are, including HCM City, Thủ Dầu Một, Di An, Biên Hòa and surrounding towns, and comprise more than 9 million people, making it the most populous metropolitan area in Vietnam and Indochina.

HCM City is a municipality at the same level as Vietnam's province. The city is divided into twenty-four administrative divisions since December 2003. Five of these Area: 1,601 km²} are the rural area. The rural districts are Nhà Bè, Cần Giuộc, Hóc Môn, Củ Chi, and Bình Chánh. The rural districts consist of communes and townships. And the remaining districts {Area: 494 km²} are urban or suburban. This includes districts one to twelve, as well as Bình, Bình Thạnh, Phú Nhuận, Thủ Đức, Bình Tân, Tân Phú and Gò Vấp. Each of these urban is subdivided into wards. Since December 2006, the city has had 259 wards, 58 communes and 5 townships.

The health care system of the city includes about 100 publicly owned hospitals or medical centers and dozens of privately owned clinics. The 1,400 bed Chợ Rẫy Hospital, upgraded by Japanese aid and the French-sponsored Institute of Cardiology is among the top medical facilities in Indochina. The Hoa Hao Medical Diagnosis Center (Medic) and FV Hospital have recently attracted many clients, including foreigners, because of the quality of their services and modern equipment.

There are about 76 universities and colleges with a total of over 380,000 students. The Ho Chi Minh City National University with 41,000 students is the most important university in

the Southern Region, comprising 6 main member schools: The University of Natural Sciences (formerly Saigon College of Sciences); The University of Social Sciences and Humanities (formerly Saigon College of Letters); The University of Technology (formerly Phu Tho National Institute of Technology); The International University, Faculty of Economics and the newly-established University of Information Technology.

2.3.4. The Health Information System in Vietnam

The Vietnamese **health system** was established on September 2, 1945. The development of the Vietnamese health system can be divided into 3 periods: 1945-1954; 1954-1975 and 1975 till now (Fritzen, 2007).

The four levels of the system - from bottom to top - are the Commune, the District, the Provincial and the National. The same applies to the drug dispensing system which also consists of four administrative levels.

Some useful and practical information about Health Information Technology (or HIT) in Vietnam:

Skilled HIT technicians	While there is great interest among health workers in Vietnam at all levels of the health system, the majority of the population is unaware of the vast potential of HIT.
Infrastructure and Resources	<ul style="list-style-type: none"> • There is a shortage of stable IT network connections throughout Vietnam, especially in rural areas and in small health centers. • Although mobile phones are prevalent in cities, they are not as widespread in rural areas; as a result, the use of telemedicine and mobiles phones as key infrastructure for HIT may not be feasible.
Cost	<ul style="list-style-type: none"> • For a health center, the cost of one computer alone can be prohibitively high, not to mention the cost of a network of computers. • Most hospitals and health centers have very limited budgets for HIT operation and maintenance. • Software is also expensive, especially the cost of the software's copyright.
Standards	HIT software is not standardized at each point of care; as a result, some hospitals must enter a patient's information repeatedly in different programs.

Table 2.3.4. HIT challenges in Vietnam (Pham & Vo, 2008)

As presented above (*Table 2.3.4*), Health Information Technology (HIT) and its role for the health field have not been prioritized. The prospect of HIT's status in Vietnam is limited by insufficient infrastructure, resources, capacity, budget and the standards of software used in the different programmes. Money is a problem for the health facilities (hospital, center, clinics, and the like), which lack the funds to purchase computer systems and suitable

software to support the health information system. However, the main problem for HIT in Vietnam are related to the skills of the health staff, the technology chosen for health programmes, a lack of awareness of the importance of HIT, and non-homogenous standards in the different health programmes.

Report system in Vietnam

MoH – the Ministry of Health in Vietnam has published report forms for three administrative levels: province, district, and wards. All these levels collect data and information about the health services within their jurisdiction. But not all the districts or provinces have been using the forms when sending in their monthly, quarterly, six-monthly, or yearly reports. For example, in the TT Hue Province, the provincial and district levels use the national forms whereas the wards almost never do.

In HCM City, the Health Services and the districts use their own customized report forms to monitor the Mother, Child, Diseases, Prevention programmes, and collect general data. However, the local fields increasingly need more detailed information, and the local health workers or managers want to have their own report designs with more parameters and the possibility of customization.

Below is an example of a report form used in the Child Programme at the Mother and Child Health Care Center in HCM City (generated by DHIS2 with BIRT), including about 40 data elements [parameters]:

Đơn vị:	Quận 12	Thời gian:	Tháng một 2009
---------	---------	------------	----------------

SỞ Y TẾ TP.HỒ CHÍ MINH
TT.CHĂM SÓC SỨC KHỎE SINH SẴN
CHƯƠNG TRÌNH SỨC KHỎE TRẺ EM
—oOo—

BÁO CÁO THÁNG
(Mẫu báo cáo hàng tháng)

I. TÌNH HÌNH QUẢN LÝ TRẺ EM

1. Số lượt trẻ đến khám

1 - 12 tháng	13 - 24 tháng	25 - 60 tháng	Tổng cộng
2795	1172	1339	5306

2. Tổng số trẻ được cân đo

1 - 12 tháng	13 - 24 tháng	25 - 60 tháng	Tổng cộng
2739	1053	1297	5089

+ Khám lần đầu tại cơ sở

1 - 12 tháng	13 - 24 tháng	25 - 60 tháng	Tổng cộng
336	30	30	396

3. Tử vong trẻ em : (Gửi danh sách đính kèm)

a. Số tử vong chu sinh

0

b. Số tử vong trẻ em từ 1 đến 5 tuổi

0

c. Số tử vong < 1 tuổi

0

4. Dự tật bẩm sinh: (mới phát hiện trong tháng)

0

II. QUẢN LÝ TRẺ EM SUY DINH DƯỠNG

1. Tình hình trẻ SDD khám trong tháng

Số trẻ còn SDD	SDD mới phát sinh	Hết SDD
663	7	25

2. Phân tích số trẻ SDD đến khám theo tháng tuổi và theo độ SDD

	1 - 6 tháng	7 - 12 tháng	13 - 24 tháng	25 - 60 tháng	Tổng số
Độ I	16	80	155	349	600
Độ II	0	3	2	5	10
Độ III	0	0	0	0	0
Tổng cộng	16	83	157	354	610

III. HOẠT ĐỘNG GIÁO DỤC SỨC KHỎE

1. Số lớp tập huấn cho công tác viên - chuyên trách viên

STT	Lớp học	Số lớp	Tổng số người tham dự
1	Chuyên trách viên	0	0
2	Công tác viên dinh dưỡng	2	12
	Tổng số:	2	12

2. Số lớp giáo dục sức khỏe

STT	Đối tượng tham dự	Số lớp	Tổng số người tham dự
1	Bà mẹ có con < 2 tuổi	8	196
2	Bà mẹ mang thai	5	104
3	Phụ nữ trong độ tuổi sinh con	0	0
4	Học sinh cấp II - III	0	0
5	Đối tượng khác	0	0
	Tổng cộng:	13	300

3. Thực hành dinh dưỡng

STT	Đối tượng tham dự	Số lớp	Tổng số người tham dự
1	Bà mẹ có con < 2 tuổi	9	203
2	Bà mẹ mang thai	9	124
3	Bà mẹ có con suy dinh dưỡng	0	0
4	Đối tượng khác	0	0
	Tổng cộng:	18	327

TRƯỞNG TRẠM

Ngày làm báo cáo: 04/05/2009

NGƯỜI LÀM BÁO CÁO

(An example from district 12, HCM City)

The National Child Report Form No. 9 looks diametrically different and contains approx. 30 data elements:

CHĂM SÓC SỨC KHOẺ TRẺ EM																																		
Đơn vị báo cáo :						Huyện Hướng Thủy						tháng 8 / 2005						Loại báo cáo :						hàng tháng										
TT	Cơ sở Y tế	Tổng số trẻ < 1 tuổi trong diện tiêm chủng	Số trẻ tiêm chủng đầy đủ 6 loại vắc xin	Số tiêm BCG	Số tiêm DPT3	Số uống phos g tại lần OPV 3	Số tiêm phos g vitamin A	Số tiêm phos g vitamin B	Số tiêm phos g vitamin C	Số tiêm phos g vitamin D	Số tiêm phos g vitamin E	Số tiêm phos g vitamin K	Mức và chất các bệnh cơ vắcxin phòng ngừa trẻ dưới 15 tuổi														Tổng số trẻ sơ sinh được chu	Tổng số trẻ sơ sinh uống < 10 ngày	Số dinh dưỡng của trẻ < 5 tuổi			Số trẻ < 16 tuổi đang uống Vitamin A		
													Bạch hầu		Ho gà		Uốn ván SS		UV khác		Bại liệt		Sởi		Lao				Tổng số	Độ I	Độ II			
													Mức	Chất	Mức	Chất	Mức	Chất	Mức	Chất	Mức	Chất	Mức	Chất	Mức	Chất							Mức	Chất
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32			
	Tổng cộng :	8541	1055	881	1159	1160	928	0	2074	5910	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	821	27	4196	121	0	4752			
1	Bệnh viện Hướng Thủy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2	Đội Bảo Vệ Bà Mẹ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
3	Thị trấn Phú Bài	1276	231	148	128	128	115	0	261	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131	0	863	0	0	656			
4	Xã Dư'ng Hoà	184	29	5	17	18	7	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	34	0	0	148			
5	Xã Phú Sơn	125	17	12	11	11	14	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	1	30	0	0	108			
6	Xã Thủy Bằng	732	75	85	75	75	75	0	286	5900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	0	146	9	0	307			
7	Xã Thủy Châu	486	78	76	87	95	72	0	182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	103	1	325	5	0	434			
8	Xã Thủy Dư'ng	1149	103	97	113	104	103	0	310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	10	472	0	0	479			
9	Xã Thủy Lư'ng	852	73	81	81	81	83	0	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	0	450	63	0	407			
10	Xã Thủy Phư'ng	1416	141	111	122	123	141	0	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	129	8	209	28	0	738			
11	Xã Thủy Phú	116	108	118	326	326	115	0	361	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111	4	823	0	0	520			
12	Xã Thủy Tân	645	59	48	58	58	59	0	140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	0	416	16	0	304			
13	Xã Thủy Thanh	640	60	43	70	70	60	0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	0	154	0	0	294			
14	Xã Thủy Văn	920	81	57	71	71	84	0	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	3	274	0	0	357			

Figure 2.3.4b: National report nr.9 about Child Health Care

(An example with the report 9: Child Health Care, with data from Huong Thuy district in August 2005)

The number of data elements or indicators does not show the actual difference between the reports above. If we look closer, we see that some data elements (for example: OPV, BCG, Vitamin A, etc.) are only present in the national report, since the local users do not need these elements or they do not have access to the data/information.

Health Management Information System (HMIS) in Vietnam

In his report, Heywood (2005) presented the infrastructure status of the Health Information System in Vietnam. The IT status was perceived as low in view of the difficulties related to the purchase of hardware and the development of software. Donor funding was the main financial resource. After a few days in Vietnam, working with the staffs in the two big cities and using a tool for the RAPID assessment of HIS, Heywood (2005) got rapid results on data Availability (data collection, data quality, data flow, compilation, feedback, and dissemination), Analysis (indicators, computerization, and software), and Use of data for action.

Heywood's report (2005) covers the main issues and also outlines the problems relating to the health system's status in Vietnam. The problems seem to persist. The lack of awareness of the pertinence and utility of data collection and report generation is the most important factor on the local, provincial and national levels. Here is some information about the status of HMIS in Vietnam.

Only the national and provincial levels and some districts and hospitals had computers. Very few commune health centers had computers, except the in the big cities. So, a goal of 10 computers per district and a computer in every commune seems a long way ahead.

The only computer system installed was MS Office, which was not adapted to data analysis or report generation. As many provinces do not have the resources to development their own software, the implementation of an application for the analysis of aggregated health data seems difficult to achieve.

With the establishment of the District Health Information System (DHIS) software, the need for a solution to above-mentioned problems has become gradually more visible. DHIS was piloted in HCM City (2 districts) and TT Hue province, but, unfortunately, due to a lack of follow-up and supervision at the pilot locations , the health staff did not use the software to its fullest capacity.

Internet access was also limited and very few provinces sent data electronically to the national level. There was not any web-based reporting of information at any level.

The statistical unit had no control over chronic data overload and a data quality assurance problem became evident as burden of data was great and because there was no built-in quality control mechanism. The data reported to the national level had not be quality controlled at any level. Feedback was also non-existent and there were no guidelines for how to use the data.

As a result of this, the different data sources would give different results. For example: "the official MMR is 90 per 100,000 (from vital registration) whereas the reality is probably closer to 165 / 100,000¹ or higher" Heywood (2005).

The data was aggregated and reported unprocessed to the higher levels health administration. These raw data were not used to monitor, manage or plan data collection activities. Furthermore, there were many problems related to data flow: parallel flows of the same information from various facilities, vertical health programmes with overlap and competing management information, no standardized report format for the horizontal flow of information from facilities to the same level of local government authorities, and different frequencies for collecting and reporting the same routine reports in different localities. These made affects on the completeness and accuracy of data at all levels.

¹

Personal communication with health worker who wishes to remain anonymous

The compilation of data was usually carried out manually or with very limited computer resources at all commune health stations and at the higher levels.

Feedback of information from the higher level to the lower levels was not a priority. Poor feedback mechanisms was a problem at all levels.

The Health Statistical Year Book includes almost every health indicator and is the main publication of MoH (Ministry of Health).

The use of indicators was a challenge, and analysis seemed to be more about calculating indicators to justify staff employment than about self-assessment or management improvement. Data analysis skills and data interpretation skills among the health staff were limited. There was little collaboration between the members of the IT staff and the health managers when the analysis was performed.

There was a lack of programmers (for the 10 national posts there were only three employees).

Some applications were tested and piloted in a couple of district health centers, district and provincial general hospitals, and provincial health offices in a few pilot provinces. Most of them were for compiling data and generating formatted reports, and therefore limited in terms of analysis and management improvement.

“Data is not used because the health staff does not know how to use it” (Heywood, 2005).

Health staff turnover was very high, leading to difficulties in terms of training.

Heywood (2005) suggested establishing guidelines for data use by management and recommended increased collaboration between IT/statistics and health/management workers.

2.3.5. HISP and Vietnam

HISP and Vietnam: the very first steps.

In the late 2004, when the HISP first established its presence in Vietnam, in Thua Thien Hue (TT Hue) Province, a group of global team members from Oslo, Norway - the coordinator, the developers, and undergraduate students - came to my college (Hue College of Sciences) looking for inter-students for the TT Hue project. Inter-students from Ho Chi Minh City also joined the team. At the time – in Ho Chi Minh City – the TMA Solutions Company became a partner alongside Huesoft (or Huecit). The main role of these partners was to train inter-students in the design and use of the DHIS1.4 and DHIS2.0 software’s open-source technology.

In summer 2005, some HISP inter-students graduated and were hired as facilitators by HISP Vietnam. In Ho Chi Minh City, two facilitators were taken on and one in Hue City. During the summer, the DHIS1.3 and DHIS1.4 versions were piloted in some districts of Hue City and Ho Chi Minh City. The Vietnamese Minister of Health (MoH) supported the project, and

signed memorandums and agreements with the international HISP (and HISP Vietnam), supplied the human resources needed in the pilot provinces (Hue City, HCM City), and monitored the implementation process.

Although the DHIS1.3 and DHIS1.4 versions had been introduced and piloted in both provinces from the start, the DHIS2.0 version became the main priority in the implementation process as soon as the prototype was released in the late 2006 in HCM City. The DHIS2.0 version was subsequently adopted in TT Hue Province, because of its technological advantages (OpenSource Software - OSS) and the support of the technical staff at the brand new team office in HCM City, including three HISP graduate inter-students at NongLam University, one of the programme's partner universities since 2004 in HCM City. The rest of the story of HISP in Vietnam will be narrated in detail in the following chapters, illustrated by the experience in the TT Hue Province and HCM City (chapter 5).

Chapter 3: Literature Preview

Contents

- 3.1. Health Management Information Systems: Development and Implementation
 - 3.2. Health Management Information Systems: Success and Failure
 - 3.3. HISP project in the previous studies
-

3.1. HMIS: Development and Implementation

Convinced of the importance of adopting a HIS/HMIS to improve the quality of health services and the future health information systems (whether management systems or patient-based systems) with some specific criteria suggested, Braa and Blobel present strategies for developing health information systems in developing countries, focusing on the development of 'basic' HISs as a first priority before or in parallel with developing more sophisticated '2nd level' systems. And there were two levels mentioned.

The level 1: local use of health data and the information needs of routine health services management were in focus. The example from South Africa was also listed. *Standardization* of health data, focusing on the key indicators needed by health managements was the first important step at this level. *Integration* of the health programmes in a common information system was the second point. In order to prepare for implementation and, later on, extensive training and support came next. For a sustainable solution approach for technology, Open Source free database application for information management at all levels was picked.

The level 2: "Sustainable development and gradual scaling up of computerized patient data system."

Many developing countries plan and test various patient-based database systems, which are more expensive and more complex than a HIS-based one in terms of aggregated data. The systems are often too ambitious and end in failure. So, a flexible approach incorporated into other HIS projects is advisable.

However, larger scale training and support schemes in the use and management of health information are part of the strategies and will typically consume 70-80% of the resources allocated to system development.

In the case of TT Hue, level 1 was initially implemented in the local pilot districts and the experience from South Africa was partly taken into consideration. However, due to a number of technical and management hurdles during a relative short period of time, no further action or progress happened.

A HIS or HMIS can be broken down into two entities: the information process and the health information system management structure with six steps for restructuring a HIS/HMIS (Lippeveld and Sauerborn, 2000). The six steps are: (1) identifying information needs and indicators, (2) defining data sources and developing data collection instruments, (3) developing data transmission and data-processing procedures, (4) ensuring use of the information, (5) planning for the required health information system resources, and (6) developing a set of organizational rules for health information system management (Lippeveld and Sauerborn, 2000).

The approach suggested is to carefully match each health information restructuring step with the existing health services system.

There are four first steps for information generating process; however, the fourth is more important than others because it pertains directly to the use of health information. For the health information system, the roles of the participants (including technical factor and human resources) are very critical while the decisional powers lie with the users who actually operate and create outputs. So, if health information (data elements and indicators) are not used; identifying data, defining data sources (and data collection), and developing transmission and procedures become useless more or less.

The management structure of a HIS/HMIS, aimed at the generation and use of information, is not simple as it comprises plans, resources, organizational rules, etc.

This suggests the need for a strategy in terms of the analysis, restructuring, and building of a HIS/HMIS. In the case of TT Hue, the first four steps were taken into consideration but were not much effective as the cooperation, support, and follow-up were lacking both on the local as well as on the global level.

3.2. HMIS: Success and Failure

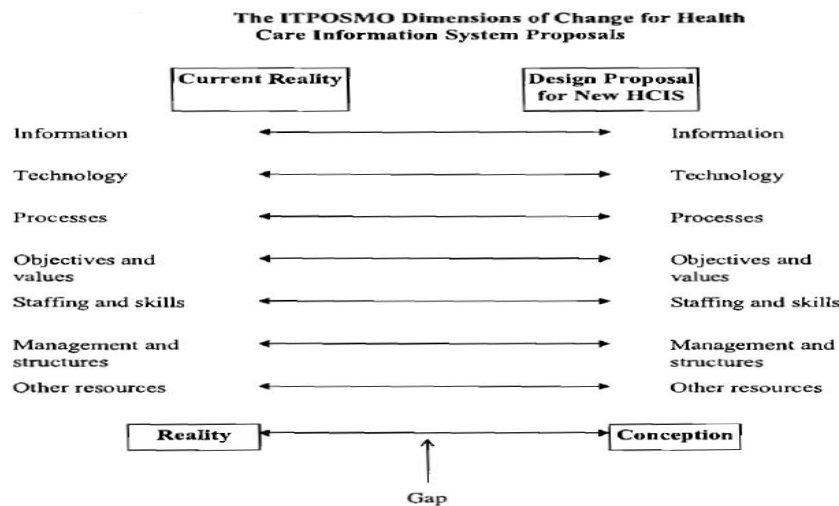


Figure 3.2. The 7 dimensions (Heeks, Mundy & Salazar, 1999)

The seven dimensions of design-actuality gaps offer a way to understand the match or mismatch between Information System (IS) design and reality. The gaps are: **I**nformation, **T**echnology, **P**rocesses, **O**bjectives and values, **S**taffing and skills, **M**anagement and structures, and **O**ther resources (money and time).

Information gap: is the discrepancy between the information system as it is used and the potential of the system design. When the discrepancy is great, the gap becomes visible.

Technology gap: is between the technology which has been used so far and the technology which will be applied for the system. If the current information system can not afford to adopt the new technology of the designed system, the gap is extreme visible.

Processes gap: is the discrepancy between the working processes of the existing information system and the intended processes. For example, the traditional process of submitting reports from the districts to the provinces -paper and phone calls - is totally counter-productive and undermines the electronic processes. If the reality status and the design are in these two extreme, probabilities of success are very low.

Objectives and values gap: is the gap between objectives and values of the existing information system and the objectives and values of the design system.

Staffing and skills gap: is the discrepancy between the skills of the staff and the skills required to operate the design information system. The staff are the human beings with limits. This must be taken into consideration. Without the required skills, the gap cannot be reduced. Qualified employees are needed if we are to get positive outcomes.

Management and structures gap: is the gap between the management and structure of the information system before and after the system has been implemented. The new information system has negative and positive aspects. The new system tries to improve the existing system and make it more effective. The negative and positive impacts need to be considered in a critical way, as the desired approach and the human capacities are not always compatible.

Other resources (time and money) gap: is the gap between the resources of time and money between the current system and the design system, If the design system requires more resources than the existing one and the organization cannot afford the expenses, the gap will definitely manifest itself.

With these gaps, the differences between the existing scenario and the future, present in the design of the system, are assessed using the above seven dimensions of Information System. The technique using the seven gap dimensions can contribute to a more comprehensive analysis of IS failure and success cases. Heeks (2001) showed that these seven dimensions provide a useful model (Figure 3.2) that can be applied in practice to a wide range of case studies. For each of these dimensions, the gaps between design and reality were rated as low, medium, and high (Heeks, 2002, p. 105).

Two case studies have been presented in this study to emphasize that “success and failure depend on the size of gap that exists between ‘current realities’ and ‘design concepts of the HCIS’”. The cases are from the UK (2 projects): A ‘Computer Link’ scheme for 26 home-based AIDS patients (Brennan and Ripich, 1994) and an expert system for computerized colonoscopy (Guah, 1998). ‘Computer Link’ case was successful because the assumptions or conceptions underlying design either matched to existing realities or required only very limited change along seven possible dimensions. The expert system failed “because of its outsize conception-reality gap” (Heeks, Mundy, and Salazar, 1999) and the design was not compatible with the hospital context.

Recently, Heeks (2002, page 106) cited an example from the Philippines that became a failure because an American health information system was introduced. The American software design assumed that there would be skilled programmers, skilled project managers, a sound technological infrastructure, and a need for information outputs similar to that of the US (Jayasuriya, 1995). The main gaps were those of information, technology, staffing and skills. However, the example shows that it may be possible to apply a system which is designed for an industrialized country to a developing country, albeit with some modifications. The difference is known as the country context gap.

The GIS (Geographic Information System) introduced in India (Barrett et al., 2001) resulted in failure: “No real operational systems were established by the end of the project period” (p. 10). The gaps were those related to information, technology, processes, objectives and values, as well as staffing and skills. The GIS was designed for different types of formal information along technical channels, whereas the reality in the field was quite unsophisticated. The design of GIS assumed “a form of working culture where decisions were made on the criteria of rationality and principles of cartographic science.” (p. 14). The reality was anything but. Another problem - relating to the conflict between representation of the forest’s design and the forest’s officers - also occurred. There was also a lack of trust in the technology, in the “new forms of rationality” (p. 19), and in people. As a result, the outcome was failure. “There were no real operational systems established by the end of the project period” (p. 10).

The SEVEN dimensions with the two cases in Vietnam will be analyzed and presented in the next chapter (see more: **5.1. and 5.2**).

In light of the success and failure of a HIS/HMIS and the failure gaps (such as conception-reality gaps, public-private sector gaps, and country gaps), some techniques have been suggested in order to increase the chance of HIS/HMIS success. The main ideas: preventing large gaps from arising in the first place and reducing these gaps once they have been identified. Here are the gap closure techniques for Greater HCIS Success (Heeks, Mundy, and Salazar, 1999):

GCT1. Legitimizing and mapping organizational reality

Understanding of the realities with their capabilities is recommended to have the proper approach and solutions for the health information system.

GCT2. Reality-supporting not rationality-imposing applications

In order to convince for acceptance or adoption, the applications of the health information system must be reality-supporting, not just rationality-imposing. This means that the benefits to users of the system are the main focus. The design is for users, not for the developers. So, cooperation and communication between users and designers (or developers) are required.

GCT3. Customization to math realities

Customization is necessary because the whole health care sectors, organizations, and even individuals must continue to recognize, express and have satisfied their unique requirements.

The realities [real field experience] are at the centre of the development and implementation of the HIS/HMIS.

GCT4. Change agents

A focus on technology is not enough to ensure the success of a HIS/HMIS. What is recommended is a multi-dimensional process of change, including managers, policies, development strategies and implementation.

GCT5. End-user development

One way to close the gap between the context and assumptions is through end-user development. So, let the user take part in the development process of the HIS/HMIS.

GCT6. Participation

Where end-user development is not feasible, conception-reality gaps can be reduced through participatory approaches that allow the worldviews of a range of stakeholders to be incorporated into HIS/HMIS design.

GCT7. Hybridization

This technique relates to the users with their knowledge of health information system and IT skills which are the basic skills of using and operating computer system. This is called hybridization.

GCT8. Incrementalism

In order to reduce the extent of any given change, breaking down and introducing slowly and in an incremental manner the changes which are planned as part of a new HIS/HMIS are recommended.

GCT9. Closing specific conception-reality gaps

There are two ways for closing specific conception-reality gaps: change current reality to make it closer to the HIS/HMIS design proposal, or change the HIS/HMIS design proposal to make it closer to reality.

GCT10. Freezing dimensions of change

The seven dimensions: **I**nformation, **T**echnology, **P**rocesses, **O**bjectives and values, **S**taffing and skills, **M**anagement and structures, and **O**ther resources (money and time). This technique recommends changes to the information system along the seven dimensions and to close (or freeze) them.

The techniques emphasize the differences between the reality and the design of a HIS and the goals are to fill these gaps or differences.

Focusing on matching the final information system to its context is more important and sustainable than matching IS implementation techniques to their context.

Six factor groups relating to the topic of Success and Failure were presented “as playing an important role in determining the successful adoption by a user group of the new system” by Land (1992).

What does “successful” in the context of an article mean?

”Successful” means the acceptance of the system as a support tool on a regular basic, although the efficiency of the system was not yet measured due to the limited time of the study.

And here are the six recommended groups for success of a HIS (Land, 1992):

Group 1: *Motivation for introducing the new system*

This relates to the objectives of introducing the system and the perceptions of stakeholders of what the new system has been developed for. If these are not strongly matched or the aims for introducing the new system are not convincing, the motivation for the stakeholders for the system will be reduced considerably.

Group 2: *Commitment to the system*

In order to obtain the commitment of the users, the system should be useful to them in terms of problem-solving. They need to trust the reliability of the system as well.

So, in some ways, leadership and skills will encourage acceptance. Today, both are often lacking.

Group 3: *Organizational culture*

The organizational culture is concerned with management style and relationships within the organization. Shared stakeholder values can be obtained by promoting an authoritarian and participative culture.

Group 4: *The management of the implementation process*

The implementation process includes: planning, training, pilot running, implementing, etc. The management of these activities involves follow-ups, coordination, cooperation, communication. The management style may be authoritarian, bureaucratic, or participative.

The important thing is that the management style should be compatible with the organizational culture. An understanding of the stakeholders and the implementation process, and the different roles, should be precise in the management style.

Group 5: *The 'distance' between the existing system and the replacement system*

An understanding of the differences between the existing system and the new system is needed to explore the gaps. If the difference is great, the new system will be less like the existing one, and the users will need more time and effort to operate the system.

So, in order to overcome these hurdles (time and effort), motivation of the individual users should be considered.

Group 6: *The technology itself*

Technology plays an important and decisive role in the adoption of a new system.

The terms of technology are at: functionality, performance (response time, response time predictability, security, helps facilities, etc.), skills required to use the new system.

The Seven gaps ITPOSMO focus on the internal factors of an Information System and compare the current system to the designed system. The Gap Closure techniques are used to analyze the Success and Failure of an Information System in an exhaustive manner, taking into account both internal and external factors (human resources, policies, agents and implementation strategies). The aim is to close the seven gaps. The definition of success of adoption or acceptance of an Information System is given in detail under the six groups, and the topic of Success and Failure has been assessed generally through the development, implementation, and maintenance of a HIS. The gap closure techniques and the six groups for success share some common ideas and they all aim to explain and describe the success of an Information System.

3.3. DHIS project in the previous studies

There are many previous studies about HISP in Vietnam, such as:

- “The Challenge of Being Open-Building an Open Source Development Network” (by Kristian Nordal, 2006)
 - “Global Software Development and Local Capacity Building: A means for improving Sustainability in Information Systems Implementations” (by Lars Helge Øverland, 2006)
-

- “OSS for health care in developing countries: Comparative case studies of DHIS2 and patient-based systems in Ethiopia and Vietnam” (Thanh Ngoc Nguyen, 2007)
- “Explore the challenges of providing documentation in open source projects” (Magrethe Store, 2007)
- “The challenges of implementing a health information system in Vietnam” (Eivind Berg, 2007)
- The different sides of the HISP project in Vietnam in its early stages of development and implementation have been explored and analyzed in these theses.

The first efforts to build and train the local team in HCM City and deal with the DHIS2 were taken on as a first node of the development network of DHIS Open Source version 2 (by the University of Oslo). The coordination problems have been explained by Nordal (2005): lack of attention from the partner due to overload of work and change of manager; unclear responsibilities of the interns; useless tasks carried out by the interns functioning as “middlemen” between the activities of the partner [outsourcing company] and the DHIS 2 development activities. The interns were limited in terms of: problems learning the new technologies; difficulty solving problems on their own; difficulty functioning in English. “The background of the participants was not something HISP had much control over, since interns were ... pick up by OutSoft” (Nordal, 2005, page 67).

The failure to establish a partnership in HCM City with an OutSoft company was also identified as a problem (Nordal, 2005). The main incentive was to provide commercial services for the DHIS, and OutSoft was disappointed by the slow pace of the DHIS1.3 pilot project.

Øverland (2006) added that the project encountered problems when trying to establish cooperative working relations when building the local team: infrastructure (e.g. IT infrastructure at the partner university, transport, and language), building capacity and skills (e.g. student behavior, negative influence of the education system). Difficult collaboration and poor communication with the partner university were also emphasized.

The report system in Vietnam has been presented in detail by Thanh (2007), but the focus of this thesis was the patient-based system and the development and use of OSS health care programmes in developing countries. There are three aspects: technological infrastructure, organizational arrangements, development processes. And the case of HISP in Vietnam was the main focus.

HISP in Vietnam has also been studied by Store (2007) and Berg (2007), who have looked at the challenges of documentation and implementation. Documentation is mainly aimed at developers in an effort to facilitate follow-up of the projects and resource sharing within the global team of HISP. Documentation is a useful tool when enticing new developers to join the open-source DHIS2 project. The implementation challenges encountered were:

infrastructure, human resources, and local commitment in terms of manpower, support and funding.

Here is my summary table of some of the previous researches in Vietnam (2006-2007):

Thesis (topic, author)	Related research focuses and findings
1. “The Challenge of Being Open-Building an Open Source Development Network” (by Kristian Nordal, 2006)	<p><u>Related focus points</u>: Local team building and training in HCM city; failure of partnership establishment.</p> <p><u>Findings</u>:</p> <p><i>For the local team</i>: limits of the interns of the team in learning new technologies, working independently, and English skills;</p> <p><i>For the failure of establishing partnership</i>: lack of attention from the partner (e.g. the objectives of the OurSoft partner no more met the approach of HISP).</p>
2. “Global Software Development and Local Capacity Building: A means for improving Sustainability in Information Systems Implementations” (by Lars Helge Øverland, 2006)	<p><u>Related focus point</u>: Local team building.</p> <p><u>Findings</u>: There were challenges, such as, infrastructures, capacity and skills of the interns within the team, communication and collaboration with the partner university.</p>
3. “OSS for health care in developing countries: Comparative case studies of DHIS2 and patient-based systems in Ethiopia and Vietnam” (Thanh Ngoc Nguyen, 2007)	<p><u>Related focus point</u>: the development and use of OSS health care programs in developing countries</p> <p><u>Findings</u>: Three aspects were discussed: technological infrastructure, organizational arrangements, development processes</p>
<p>4. “Explore the challenges of providing documentation in open source projects” (Magrethe Store, 2007)</p> <p>“The challenges of implementing a health information system in Vietnam” (Eivind Berg, 2007)</p>	<p><u>Related focus point</u>: the challenges of documentation and implementation</p> <p><u>Findings</u>:</p> <p><i>For documentation</i>: very useful to the developers in order to learn, share, and follow up within the community.</p> <p><i>For implementation</i>: with challenges, such as: infrastructure, human resources, and local commitment in terms of manpower, support and funding.</p>

Table 3.3: The summary table of some of the previous researches in Vietnam (2006-2007)

Chapter 4: Methodology

Contents

4.1. Action research

4.2. Research methods

4.2.1. Field-based Observations

4.2.2. Interviews

4.2.3. Document analysis

4.1. Action Research

Action research emphasizes activities and participation to the field. And it is a combination of theory and practice (researchers and practitioners). Action research is an iteration process involving researchers and practitioners acting together on a specific circle of activities, including diagnosis, action intervention, and reflective learning.

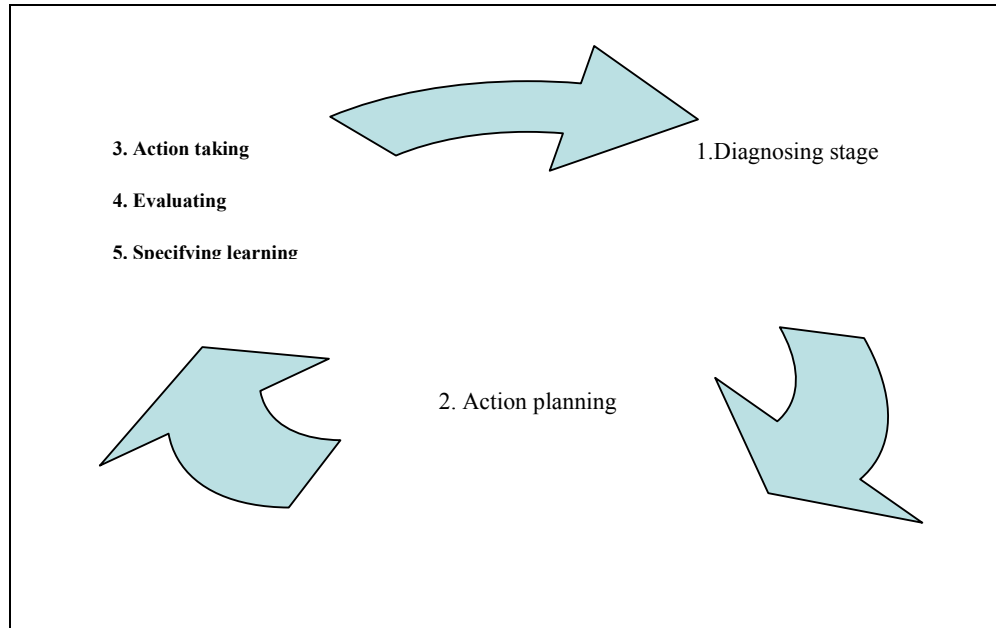


Figure 4.3a: Action research circle

DIAGNOSING: when I arrived, the field was very confusing, complicated and not easily understood. I spent much of my time exploring and writing down my observations, interviews, group discussions and meetings with the local team in HCM City.

ACTION PLANNING: the exploration and knowledge acquired in the field were taken seriously or noticed by the local and global teams, mainly because of factors such as inadequate communication between the local and the global levels, lacking motivation, difficult relations between the members of the local teams (especially between the manager and the other members). Just sending one or more emails is not of much help, since the local team needs instant and helpful responses (especially when dealing with sensitive issues relating to the ignorance and the unwillingness of certain actors and interpersonal conflicts) and the words from a student (me) did not carry much weight. More than anything else, the role of the local manager (as a motivator, supporter, etc.) is essential.

After the workshop in August 2008, HISP Vietnam planned to develop and release the latest version of DHIS 2 for the Mother and Child Health Care Center, with two reports especially adapted to the Mother and Child programme. Later on, the DHIS 2 was introduced to the other province, Can Tho province, where we assumed that the national report forms would be in use. With the BIRT-Business Intelligent Reporting

Tool and Report Table concept of DHIS 2 design, the advanced report forms with different fields, time variables and formula (for indicators, for example) have been partly solved. This means that DHIS 2 can support customized reports for local use at in the province and districts.

The action plans were discussed within the team (a typical meeting as concluded in Appendix I, J) with the assistance of the health manager and/or the coordinator of HISP Vietnam. Ideally, the team members of HISP Vietnam and the managers of the health programmes (Mother and Child programme at the Mother and Child Health Care Center, for example) were responsible for designing, testing and implementing the DHIS 2's new report system. The team members were active agents who contacted the HISP global team for technical support and the health officers and health managers in order to better understand the local health report system.

For me, in order to match the team goals, I also had my own action plans during the four months in HCM City with the team. They were:

- Plan for the training of the new local team members: HISP, DHIS2, OpenHealth, and other related tools (check-out, build and commit source code; document HISP using wiki pages; report bugs and the similar problems using wikiTrac, etc.). This is an important task in order to help the newbie to integrate with the team, the local and the global.
- Schedule, plan and draw up weekly “activity lists” on the white board and ensure that updated emails were sent out once a week to remind the team members of their tasks and to ensure follow up. In many ways, I functioned as a consultant, support staff and facilitator for the local team.

Needless to say, team working requires discussions and meetings to solve problems of a technical or management nature. Both online and offline team meetings were important. I worked with the team members to solve the practical issues, both technical with the help of the support from the global technical team and social issues relating to agreements and so on.

During my fieldwork time, training sessions were a main ingredient and took up much of my time. I trained both the new team members and the end users. This was a good way to understand and be close to members and users while doing my research. Of course, the ‘mutual learning’ included all of us: the team members, the users and I. Various methods were employed, both online and off-line, and follow-up, open-question and discussion sessions were organized so as to ensure that everyone understood the core mission.

ACTION TAKING, EVALUATING, and LEARNING: due to the short duration of the fieldwork, these stages were not completely and thoroughly accomplished. In order to translate the effects or convert the understanding / plans into actions,

numerous aspects must be taken into consideration, for example: strategies, human resources, investment (time, money and efforts), support tools (mainly for technical issues related to DHIS2), and so on. The three phases of the action research cycle were conducted and monitored by the team members, the managers M1 and M2 (*see more section 5.0 about the manager*) and the HISP coordinator from the University of Oslo. The actions I took part in happened in HCM City at the Mother and Child Health Care Center from August to November 2008.

HISP (with DHIS software) is an action research project and does not aim to produce a specific product or outcome, but rather aims to improve the health information system. So, ‘mutual learning’ and ‘responsibility’ both imply opportunities and challenges. You need awareness and enthusiasm from both the local and the global teams.

Summarized, the tasks what I have done can be concluded as follows:

1. Analyse the current issues and discuss them with the team.
2. Discuss the analysed issues by emailing the involved people: coordinators, managers, local team members, former local managers, and the health officers of Mother and Child Health Care Center (MCHC).
3. Chat, talk and discuss with the team members (especially in group or ‘peer-to-peer’ when we were having problems related to the progress of the plans), mainly via email, instant messages and face-to-face meetings when needed.
4. Work on OpenHealth with HCM database in order to show tables with data (aggregated data for the following parameters: period, data elements, indicators, orgunits). Link the data with the map of HCM City with districts.
5. Deal with DHIS2 with HCM database and produce reports with BIRT: convert database from mysql to postgresSQL, design the reports with BIRT and then embed these into the DHIS2 systems using the Report services function of the DHIS2 (report tables, configurations, etc).

Referring to the action research cycle, I was much involved in the 1st phase: diagnosing and the 3rd phase: action taking - more than in any of the other phases.

4.2. Research methods

Three methods have been included in the research: Observation, Interviews, and Document Analysis.

4.2.1. Field-based Observations

Observations were my first methods used in order to see and understand and see how things worked in practice, not relying on words or promises.

Just hearing from one or two sides was not very productive; whereas seeing what people actually did and how they behaved in certain contexts worked for me.

The fact that I had not known any specific information about the status of DHIS implementation in Vietnam when I came there in August totally existed. I still remember the very first days of August when I was there at the HISP Vietnam office in HCM City to see the team and the manager M2. During these days, I had chances to see what they were doing, how they were working together to support the users, and what the main challenges were for them to deal with development and implementation DHIS. I also compared what I saw and witnessed to what I had experienced so far.

Observation went with listening. The manager M2 and the members of HISP Vietnam told me different stories about the implementation status of the DHIS 2 in Vietnam. Just hearing from both sides was not effective in my opinion, but seeing what people did and how they behaved in the different settings was helpful.

My observations focused on the following:

- What?

At work, how do the team members react to and deal with the technical and social problems that arise?

In meetings and discussions within the team only or with the health officers and managers of the Mother and Child Health Care Center, how and why did people act, behave, and contribute to solve the problems?

What do the team members and health workers need in terms of a local HIS system?

How do developers, facilitators, and users of the Health Care Center cooperate in order to get the work done?

- Who?

The local team and health workers at the Mother and Child Health Care Center, IT health workers from other provinces (through the conference and workshop in August 2008)

- Where?

At the IT room of the Mother and Child Health Care Center, also in other areas of the Mother and Child Health Care Center, and at the HISP Vietnam conference and workshop at VungTau in August 2008.

As an observer, I was primarily an onlooker gathering information about the field and the people involved: the developers, the users, and the managers.

When observing the developers, I have information from the views of the developers, mainly how and how come they did and dealt with the system, mainly for designing the reports for the health programmes.

When observing the users through the training sections at the Workshop in VungTau and at the Mother and Child Health Care Center, I have chances to explore the users' point of view towards the DHIS system: what do they need and what is really useful to them?

When observing the managers (the managers of HISP Vietnam team and the managers of the health programmes) during the discussions and meetings, the opinions of the managers are also revealed. I therefore understand more the concerns of the managers (both local HISP managers and health managers) when a HIS is designed, tested and implemented.

4.2.2. Interviews

Interviews with open-questions have been taken during and after my fieldwork in HCM City in both formal and informal way. For example,

Formal way through face-to-face talks or online chatting tools (Google talk or Yahoo Messenger): "Can I ask you about the advantages and challenges when implementing DHIS software in HCM City so far?"; "What do you think if I say that HISP in Vietnam has not been active?" etc.

Informal way, mainly through chatting after the working hours or at lunch time and through chatting tools, such as Google Talk or Yahoo Messenger: "Hi, how do you feel for today?"; "Are you content with the meeting/discussion today? Tell me!"

This is the second method I have used to understand and analyze the cases of HISP, both in HCM City and in the TT Hue province. I am a Vietnamese, so I had no difficulty carrying out both online and offline interviews, formal and informal encounters.

I have also learnt that informal conversations and chats can be very helpful and informative, especially when I first joined the local team as a member.

The interviews mainly involved the local members of the HISP Vietnam team, health officers and workers at the Mother and Child Health Care Center, as well as the health workers from other provinces taking part in the training sessions at the workshop in August.

First, I needed to establish what was happening and why, especially during the conference and workshop at VungTau in August 2008. Second, I felt that there were many problems linked to the projects and as a newcomer interviews were the best solution. Later, having worked with the team for a few months, there were still a host of things that were not simple to grasp without talking to and asking people about their opinion as insiders, especially the team members and the health workers.

The data I got from the interviews is taken notes and then analyzed sentences by sentences relating to the questions and the topic focused. As mentioned above, through Google Talk and Yahoo Messenger tool, I was able to save the conversations onto my computer. For the

formal or face-to-face conversations, I had to take notes at the time of the interview or right away after the talk ended.

4.2.3. Document analysis

Document analysis is the third method listed and quite necessary to me. Although I had experience from the field before I learnt the theories of the HISP, I had difficulty dealing with, using and applying the literature and to understand and explore the field. Reading previous theses and relevant texts, articles from both inside and outside of HISP, has also been very useful to me.

I have read previous studies of the HISP project in Vietnam, in particular the master theses of Nordal (2006), Øverland (2006), Berg (2007), Store (2007), Nguyen (2007), and documents about the Health System, Health Services and Health Department in Vietnam. These readings helped me understand contracts, agreements, and plans involved.

Other field-related sources that were very useful was minutes from meetings and forwarded emails from the members describing the problems relating to their conflicts with the manager M2 (*see more section 5.0 about the manager*). All of these I got from HISP website (hisp.info, for the previous theses) and the emails sent by the team members and managers of HISP Vietnam.

Chapter 5: Discussion

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5.0. The background of the cases with my experience and findings

Based on my two-year experience (2005-2007) and my fieldwork in HCM in 2008, this section gives an introduction to the cases of HISP in Vietnam (in the TT Hue Province and HCM City). As for the TT Hue Province, team building and the implementation status are in focus, whereas for HCM City, the development of DHIS2 and intra-team problems are the main points.

HISP team in TT Hue province: (2004-2008)

The local team, including 3 people from HueCIT (the manager of the Research and Applications Department and other members of his staff: 1 technician, 1 translator), 1 officer from the TT Hue Health Services, and a research fellow from the University of Oslo, had a meeting and discussed the future of the project in TT Hue Province. At that time, HueCIT was not very interested in supporting the project so the project manager of HISP at HueCIT wanted the Health Services to be more involved. After the meeting, everyone agreed to hire a facilitator to work at the Health Services. The facilitator should help with technical problems and assist the team during implementation. HISP would supply some funding to pay for gas when travelling to the districts, the acquisition of one computer for the Health Services, as well as pay the facilitator's salary. An agreement was signed for to this effect.

Having worked as a HISP inter-student for more than 6 months, I was hired as a facilitator for the HISP local team of the TT Hue Province at the Health Services of TT Hue after graduating in June.

A HIS Agreements were signed between me and the involved parties (see appendices **B, C, D and E**): The Planning and Financial Department of the Ministry of Health, HISP (by the research fellows from the University of Oslo), HueCIT - an OutSoft company in the TT Hue Province - and the Health Services of TT Hue. My contract of employment with HISP and the Health Services of TT Hue was signed in June 2005 (see **appendix: G**).

The team primarily worked in a common room at the Research and Applications Department of an IT company. After August 2005, we moved to the Statistical and Financial Department of the Health Services of TT, which had a totally different atmosphere, because it is the administrative center of TT Hue.

After the move, HueCIT gradually transferred all tasks and responsibilities to the team, which – from late 2005 to 2007 – included the newly hired facilitator and an officer from the Health Services. Two inter-students from Hue College of Sciences were recruited later, but they soon left the team because they did not find a suitable topic for their thesis within the HISP project.

The implementation in the second half year of 2006 was largely performed by the local users in the extended pilot districts of Hương Trà, Phú Lộc, Nam Đông and also in the previous pilot districts: Hương Thủy and Thành phố Huế (or Kim Long). The main task was entering data into 4 national report forms: nr. 9 (see Fig. 2.3.4a), 10 (see Appendix L), 11 (see Appendix M), and 12 (see Appendix N).

The data were entered quarterly (every three months) using these 4 report forms. Funding for transportation was supplied by the Health Services (but required application prior to the visits, see **appendix H**). Visits to the extended districts were also quarterly.s

Implementation outcomes in 2006 with DHIS2

The DHIS2.0 project could not afford the technical solutions required, such as solutions for data entry using report forms no. 6, 8, and 15. The 15 national reports are quarterly, six-monthly, or yearly reports, and the users (health workers/officers at the districts) normally enter data only twice during a half year.

A considerable change in second half of 2007

The DHIS2.0 web application was introduced in all districts of the TT Hue Province. The Vietnamese HISP team paid regular visits and supported the team with focus on training of the workers from the districts at the Health Services of TT Hue. The training sessions took a few days. The strategy was that the users (workers/officers) in the districts would enter data (via the Internet) into the DHIS2 system installed on the computer system at the Statistic and Planning Department of the Health Services of TT Hue. The system would be monitored and maintained by the HISP team in HCM City.

In the late 2008, HISP Vietnam intended to continue the project in TT Hue, but this plan did not work out owing to a number of factors, primarily because the trust has been lost and the officer (who had been working with the local HISP team earlier) was not in Hue City.

How was the local team of HCM city in 2008?

The inadequate information about the HISP team and the implementation status in HCM City disappointed me when I first came to meet the team at the Vietnamese HISP office. First of all, the actual number of members working for the team and the implementation status of the DHIS2 system was not as given on the web site.

There were only two active members, plus the local manager, and the DHIS2 software had not been implemented because of a variety of reasons, as the manager and the members explained. The reduced team was working in a different direction from the HISP, the goal of which is building a DHIS-District Health Information System.

Instead of implementing and maintaining the DHIS2, they were implementing OpenEPR – Open Electronic Patient Record – for the Mother and Child Health Care Center, where HISP Vietnam is located. The OpenEPR software still had many technical problems at the time, and the team had their social conflicts. Many problems needed solving, the worst relating to database capacity and system consistency. The team members reported more than one system crashes in which thousands of records were lost. Clearly, this is the nightmare of any information system operator. As a result of the problems, the users' confidence in the OpenEPR and also in the HISP project was significantly reduced. The OpenEPR was referred to as DHIS2+ but is based on a completely different technology; i.e. php and mySQL and not Java.

Besides, the two team members were not satisfied with the manager for a number of reasons

related to the management style and the decision-making process. Sometimes the team members just followed orders or did what they had to do without getting comments or feedback, and sometimes they followed their own scheme. A few days after arriving in HCM City for the field work, I had already heard many stories from both sides.

The manager complained about the implementation process and the strategies, claiming that they were uselessness in combination with the existing national reporting system: “*The current use of the DHIS is somehow not useful because the Statistics Department do not own the data they collect and use for statistics. He added that the department is a ‘fault/mistake of MoH’ (even Mr. Huy from MoH - the then manager of HISP Vietnam – agreed with this)*”. His solution to the problem was to support the need for reports by the local health units: hospitals, health clinics, etc. His approach consisted in customizing the OpenEPR software to support patient records, and hospital fees for the Mother and Child Health Care Center.

The team members in turn complained about the manager. For example, they complained about the different or even opposite views when it comes to implementation strategy. The manager preferred implementing the system in all units simultaneously, whereas the team members were interested in a more incremental process, starting with one or more pilot projects before expanding into all units.

They told me their stories and I had no presumptions or prejudice as the stories were told from both sides.

The bulk of my fieldwork took place in August, because it was in August that I first met and worked with the team and participated in the HISP workshop.

During August, I had a chance to learn more about the status of the local team and the implementation of the DHIS2 in HCM City. Unfortunately, everything was not alright. The local team members said that they did not want to continue working for HISP if the current management was not replaced. The main problem was a deep distrust of the manager. It was a very human and sensitive issue.

The story of my fieldwork in the TT Hue Province and HCM City will be analysed in detail in the following sections of this chapter.

Note: The managers mentioned throughout the thesis will be referred to as M1 and M2.

M1: The manager who worked for HISP Vietnam from 2004 to 2006. He has been back as a local manager since late 2008.

M2: The manager who worked for HISP Vietnam from 2007 to late 2008.

The reasons for this replacement:

- In 2007, after finishing his Master’s Programme in Health Information Systems at the University of Oslo, M2 returned to Vietnam and was promoted manager of HISP Vietnam, while M1 became HISP Vietnam’s consultant. M1 is a teacher at the Training Center for health officers in HCM City and has management experience from national and international health projects. M2 has a background in IT only and is

less skilled in management and the health sector.

- In the late 2008, many problems arose within the local team of HCM City. These problems were related to the management and to the implementation strategies. After visits from the Vietnamese HISP coordinator, the former manager, M1 was back as manager of HISP Vietnam. The reinstatement of M1 came about because no-one else in the team could fill the position. M2 also had to leave Vietnam for his PhD Programme in the early 2009.

5.1. The case in TT Hue province

As we have seen in the previous section, there are some important points which need to be considered in detail in terms of the seven gap elements (Heeks et. al. 1999. For more about the seven gap dimensions: see 3.2). The dimensions of gaps for the case of TT Hue are: **Information, Technology, Processes, Staffing and Skills, and Other resources** (money and time). The parameters **Technology and Staffing and Skills** dimension are the main focus. Below I will elucidate the main points.

5.1.1. The gap: Information

This is the first dimension of the seven. It is about the gap between the information system in reality and the information system of the design. In this context, those are: data elements, data structures, indicators and reports.

The Health Information System of TT Hue in 2004 before DHIS1.3 was implemented:

- The health data collected correspond to the fixed data elements and indicators from the required forms (e.g., the 15 national forms for provincial and ward levels). We could not obtain all the data needed for the reports on a district level, and the local districts' data needs were not included in the district reports or in the ward reports.

So, at the district level, many reports could not be filled out because the health officer did not have the required information for all the form fields in the reports. Every time reports were made; a lot of work was spent checking that all the data entries and indicators had been filled in. Moreover, the team had to follow up the ward reports and remind people to collect the extra obligatory data.

Introducing and piloting DHIS1.3 system in 2004:

- With a computer-based system which could support for generating reports without manual calculations was installed.
- Customized reports were supported by DHIS1.3 and the users could filter out any data elements and indicators from the database whenever necessary.

From an information point of view, the DHIS1.3 or even the later version of the DHIS (1.4 and 2.0) had not been updated so as to function with the current health information system. Although the DHIS2.0 is the latest version of the DHIS, we could not convince the users that

it was indeed a basic requirement. This because the report-generating function had not yet been implemented for all the national report forms. The paper-based reporting system is still the dominant method. The paper-based and computer-based information-gathering systems are clearly different, and major changes are needed to ensure the correct transfer of data. For example, the report designs must be homogenized at all levels: wards, districts, and provinces. This lack of compatibility creates a gap between the current Health Information System and the design of the HIS of DHIS systems.

5.1.2. The gap: Technology

Technology is the second dimension of the seven gaps. It refers to the gap between the technology used in the information system and the technology of the design system. In this context, this means the technology of DHIS software.

The Health Information System of TT Hue in 2004 before DHIS1.3 was implemented:

- The extra tools used for calculations were a calculator, an eraser, a ruler, etc. – useful when adding the data for all districts. In order to get the total data for the province and the district, the health workers collected the data from the wards. Compiling the statistics became a nightmare for them, because it entailed a lot of time, patience, and accuracy.

Introducing and piloting the DHIS1.3 system in 2004:

- The first two pilot districts in the TT Hue Province were given the computer systems needed to install DHIS1.3.
- The support team included technicians who were in charge of training and troubleshooting the DHIS1.3, and health experts from the Health Services who explained and gave advice on relevant health questions and provided data elements and indicators for the reports.

However, when the DHIS1.3 project was expanded and the extended districts needed more reports, things were complicated for a number of reasons, such as many bugs linked to the MS Access applications in the computer at the districts, and inadequate system user frequency (monthly, quarterly, six-monthly and yearly).

All of these issues were still present when the DHIS1.4 was implemented.

The motivations for the DHIS1.4 release and implementation were mainly seen at the developers' level. The system has a better design structure for the database, but the more user-friendly interface was less evident.

We also experienced technical problems in the second term relating to the **stableness** of the DHIS1.4 systems. For example, the newer versions did not include the stable functions of the previous versions; error messages in English often appeared on the screen causing confusions among the users; the data was entered but could not generate reports, because the data entered

and the data mart (or processed/aggregated data) were not compatible, and/or the data mart function/module did not support the report modules correctly.

The DHIS2.0 version based on Java platform, although it provides a different and promising approach from the previous versions and has more advanced technology, demands more adaptation for use in the field and better infrastructure. With the current status of the TT Hue project, the system was not affordable. Because the DHIS2.0 could not support report-generation properly, health workers still had to struggle with paper reports or use other applications, such as MS word, MS Excel, and even other applications such as Medisoft which was seen as a competitor to the DHIS.

This situation shows a gap between the technology of the Health Information System-HIS in 2004 and the design deficiency of the HIS through three versions of the DHIS. The changes required to customize the design were quite considerable, and from the start, the districts had a computer system so that the new technologies of the DHIS versions were perceived as an unnecessary challenge to them.

5.1.3. The gap: Processes

This is the third dimension of the seven gaps. It is about the discrepancy between the existing processes of the information system and the processes which the new design is meant to to implement. This directly affects the processes of dealing with health data and information. The IS design is a DHIS software.

The Health Information System of TT Hue in 2004 before DHIS1.3:

- Paper-based reports comply with the national forms for national, district, and the ward level.

In some districts, local health administrative units have to design their own reports in Microsoft Word. They fill in the data when the reports from the wards arrive (monthly or quarterly depending on the type of report) and print them out and submit them to the local committees or to the Health Services of the TT Hue Province.

As many districts could not afford computers for the statistical tasks, they simply asked the other departments to design customized forms for the reports and then used a photocopier for the wards and their statistics.

Introducing and piloting DHIS1.3 system in 2004:

- Making reports and doing calculations, using the DHIS1.3 software.

In the pilot districts – the Huong Thuy district and Hue City – the health workers only had to enter the data for the wards (monthly or quarterly) and then the reports were generated by the generate-report function of the DHIS1.3. The computer-generated reports could be printed out and submitted to the provincial level or saved in the computer for future reference.

The pilot stage of the DHIS1.3 - requiring only two national reports for the Mother and Child Care Center - worked very well. The health workers at the two districts - Huong Thuy and Hue City - were released from the boring and repetitive reporting job. The health worker at the Huong Thuy district was very eager to have a computer system for her reporting.

One year after the implementation of the system in these two pilot districts, the impact on the report-generating process was obvious: the generation of reports had been computerized and the computer was used. Because the DHIS1.3 could not be used with all types of forms (there are 15 different national forms), other applications such as MS Word, MS Access and Medisoft were provided by HISP to run on the DHIS1.3. The same situation arose when a later version of the DHIS (1.4 and 2.0) were installed.

Although the reporting routine of the health workers changed somewhat with the computer, the actual goals of the DHIS system were not achieved. The DHIS aims to build a computer-generated report system for the province in particular and for the country in general. The traditional working methods included using informal report forms and telephone calls when collecting data. The various reports from the wards, etc., could not be altered simply by providing computer systems and HIS software in a short time.

The processes of making reports in 2004 was informal and the reporting system was not uniform at the lower levels, i.e., the communes, wards, and districts. The design of the DHIS1.4 requires a formal report process and a standardization of health data parameters and indicators. So, the discrepancy between the actual processes used in the Health System and the models proposed by the DHIS is observable.

5.1.4. The gap: Objectives and Values

This is the fourth dimension of the seven gaps. It is about the discrepancy between the objectives and values of the information system and the objectives and values which the DHIS design want to carry out.

The possibilities of health statistics and a new reporting and planning system did not interest all levels of the health system. Many reasons were given. Either the health managers did not trust the data/information reported or the quality of the data collected was low. Such was the situation of the existing health system in 2004 before DHIS was first piloted and implemented.

The concept and the design of the DHIS are helpful for both health workers and managers. The DHIS can help them collect data and monitor the information in order to make more appropriate decisions so as to improve the health system. The quality of the data has the highest priority. Earlier, the health workers and managers could use MS Office application (MS Word and MS Excel) to make reports, graphs, and charts. But the DHIS, which is specially designed for the requirements of their professional field, seems a much better choice.

The DHIS team tried to convince the health sector of the need for change by introducing a Health Information System programme and by instructing the health officers in the

importance of data, in the usefulness of information derived from the collected data, and in the improvement of the ensuing decision-making process. The opposition to the changes created a gap which was not easily filled.

5.1.5. The gap: Staffing and skills

This is the fifth dimension of the seven. It is about the gap between staffing and the skills required by the health workers and manager to implement the DHIS system.

Some basic requirements for the users to the implementation of DHIS:

- User skills: basic knowledge of computer systems (turn on/off, open and close an application, etc.) and knowledge of the health parameters or indicators of the Health Information System-HIS. The users also need to know how to operate the DHIS, basically how to open/close the system, enter data, generate and export reports, etc.
- The technical and professional support staff on the implementing team: how to troubleshoot the DHIS1.3 system (used with the Windows Operating System and MS Office), familiarity with health statistics.

However, in practice, the computer systems in the districts were poor and the health workers knew little about computers. So, whenever they had small irrelevant problems with the computers, they called for help because they thought that the new DHIS 1.4 software had corrupted their computers. In some districts, the health workers were reluctant to learn new skills, since the training required effort and time, and they had other tasks to perform (besides reporting), such as the collection and evaluation of patient records and professional health tasks (the health officer at the Statistics and Planning Department of the health units is normally a nurse or a doctor. It was difficult to find professional statisticians, except in the Huong Thuy district in 2005-2006).

Although there were benefits connected with using the new system instead of doing everything manually (e.g., the Huong Thuy district), the health workers had to spend quite some time and effort learning and acquiring the necessary computer skills and, at the same time, they had to fill in the reports manually because the system could only support 2 report forms.

In 2004, when the HISP project was launched in the TT Hue Province, the health officers in many districts lacked the skills needed to operate a computer system and a HIS for their reporting. Such skills are required for a computer-based HIS such as the DHIS. So, we see a gap between the skills needed to run the DHIS and the capacity of the health system workers.

5.1.6. The gap: Other resources (money and time)

This is the last dimension of the seven but not the less important dimension to a HIS. It is about the gap between the resources (money and time) of the field and the resources (money and time) which the system may need to successfully run the DHIS software.

The basic needs of a HIS system in the field: utility and precision of the systems is needed in order to gain the trust of the health workers and officials so as to relieve them of time-consuming manual tasks. When it comes to the implementation and maintenance of the system, money is a main concern for the health units.

Purchasing computer systems and training skilled staff requires financial support, especially when the project is in its initial phases, tested and implemented. Keeping the system functioning also requires money.

Along with financial investment, time is a vital factor for the local health units.

As for the case in the TT Hue Province, most of the health departments in the districts have a very limited budget. Without the supports of sponsors such as HISP, it is impossible for them to carry out any project, especially those involving technology and human resources.

As for the local health units (at communes, wards, and districts, especially in the rural areas) in 2004, adopting, maintaining, and making use of computerize systems were the main challenge, as they had more expenses for electricity, computers, and salaries for the health workers operating the system, phone bills for calls within the HISP local team in Hue City. Time was also a challenge for the local health units. Besides adhering to the old working routine that they were already familiar with, they have to spend time learning about the new DHIS report-generating system. The 2004 staff members were not young and had difficulty learning quickly.

In other words, when I compare the resources of the 2004 health system with the requirements of the DHIS design, the gap becomes evident.

5.2. The case in HCM city

The case of HCM City will be analyzed with the 7 dimensions (Heeks 1999).

I had not been involved in the implementation of the system in HCM City in 2004, but during my fieldwork in 2008, the main focus was the 'objectives and values' dimension. In contrast with the TT Hue Province, HCM City is a modern city and the infrastructure and staff's skills were not a problem when the DHIS1.3 was launched in 2004.

While in the TT Hue Province, the DHIS was piloted by the Health Services of the TT Hue Province – an administrative unit - in HCM City, the DHIS was installed at a functional unit, the Mother and Child Health Care Center. This increased the awareness to the discrepancy between the objectives of the programme and the needs of the management of a functional unit.

5.2.1. The gap: Objectives and values

The main objectives of the Mother and Child Health Care Center in 2004 were to build a system that could support report-generating and analysis, and to train the health workers who are in charge of the health data collection and the ensuing decision-making and application. Since 2006, HISP Vietnam has had an office at the Mother and Child Health Care Center

with a view to supporting the IT department of the center and help with the implementation of the DHIS software.

From 2007 to August 2008, the main tasks of the team were building, implementing, and maintaining the OpenEPR software, as well as developing, customizing, and testing the DHIS2 before implementation. This resulted from a change of the organization's objectives (the Mother and Child Health Care Center) in 2007, as they needed more support to solve their requirements in terms of computerized patient data, and keeping track of hospital fees.

The manager's strategy (manager M2, see more the note at the end of section: **5.0**) was too local and too conservative, and the local team did not follow the HISP's global vision of a DHIS (not a Patient Record system like OpenEPR, more complicated and failure prone) which was the main goal.

Information about the local status was very inadequate. The local website at that time did not contain vital information about the team: what were they doing? What were their goals? What made their work relevant to HISP? If I had not gone to HCM City for the fieldwork, I may not have been able to gather information about the project and the system at all.

For the administrative offices, statistical tools are useful and necessary, whereas for professional centers like the Mother and Child Health Care Center in HCM City, different more basic tools are needed, such as a patient-record management system, a hospital-fee system, patient-card system, and financial management applications.

These different DHIS requirements could not be provided by the support team for the field. However, that was not the mission either. The mission of the DHIS since 2004 was to tool the units for statistics and reporting.

In 2007, there was a change of manager (M1 became a consultant and M2 became the manager, see more in section **2.4.5**) for the local team in Vietnam. The new manager's strategy was not compatible with the tool and the needs of the field (i.e. the Mother and Child Health Care Center). As a result, the DHIS was partly abandoned and was only restarted in August 2008 when the global team came and explained the new version of the DHIS2.0, which made the report-making affordable. Without this visit, the situation of the DHIS in HCM City would not have improved.

The lesson we learn from this can is that meeting the requirements of the field is not necessarily the first priority. The visions and objectives of the HISP organization and the creation of a District Health Information System are considered more important to achieve.

In 2004, the DHIS model used to support report-making and data-analysis was still not quite adapted to the reality. For example, the report system at the Mother and Child Health Care Center supported only two report forms and one design. So, from a technological point of view, the 2004 DHIS1.3 version was affordable great improvement.

When the project was carried out, the vision and objectives gradually changed and the requirements increased. The DHIS model became less useful as it was before. The gap would become evident later on.

The summary table for the cases with the Seven dimensions (with rate):

The Seven Dimensions (ITPOSMO Gaps)	TT Hue province (2004-2008)	HCM city (2008)
Information	√	
Technology	√ (high)	
Processes	√	
Objectiveness and values	√	√
Staffing and skills	√ (high)	
Management and structures		
Other resources: money and time	√	

√: the gap!

Table 5.2. Summary of the gaps present in the cases of Vietnam (in TT Hue province from 2004-2008 and HCM City in 2008)

5.3. Discussion of the cases

5.3.1. The case of the TT Hue province

There are many positive impacts, such as

- Computerization of two pilot districts with a system supported by HISP, especially in the Hương Thủy district.
- Training of health statisticians: required because many of the health workers in charge of statistics had little or no knowledge of health parameters or indicators, especially in Hue City and the Hương Thủy district.
- Awareness of the beneficial effects of a HIS/HMIS: the system is customized to the needs of the health manager of the health units in the districts, but also at province level.
- Communication between the districts and the province: relations have become more friendly and supportive. Regular visits and feedback from the province to the districts when problems pertaining to the systems and report generation in the districts arose.

However, since late 2007, after a customized OpenEPR had been implemented without feedbacks and supports, the HISP project in TT Hue province has become quiet. And when

HISP Vietnam wanted to continue the project in the late of 2008, it did not work out. The reasons for this can be traced back to the health officer who had been involved in HISP project for years, the managers of HISP Vietnam team and of the Statistical department of TT Hue province. They were not enthusiastic about the project being continued in the TT Hue province.

The M1 of HISP Vietnam also admitted that the neglect of the HISP Vietnam team towards the TT Hue province was indeed strange in view of the lack of any official texts between HISP and the Health Services. The case of the TT Hue province was discussed within the team afterwards in a meeting.

So, the utility of the software and the role of the implementing team need to be further evaluated and suitable solutions found. For example, instead of saying that the users are lazy or lack enthusiasm, the team management could be more proactive and positive.

Implementing and testing, are both possible?

The idea of implementing the programme when the software was still being developed in order to get feedback on the needs of the users and at the same time testing the system in the absence of testers or teams able to perform these types of tasks was risky. However, it did give the users in the pilot districts the possibility to practice their data-entering skills and to familiarize themselves with computerized systems. Their feedback was not bad and quite comprehensible at the time; however, no safe solution that could not be applied in a long-term project was suggested. On a daily basis, the users could see whether or not the system gave them more problems to be solved than the paper-based systems. The situation could give rise to resistance to the DHIS system.

Acceptance of an information system takes time. It is not easy to get the users' approval when the main goals and support features are not clearly defined. When you implement an information system, what are the main goals and what are the benefits?

Discussion about Cooperation

Differences between the mission of the HISP project and the objectives of the Health Services (or health units in the districts) have emerged. HISP is an educational study project. Its outcomes are not products but the result of specific processes. The Health Services or districts just want a product ready to install and are not interested in how and why the product should be installed.

Possible suggestions?

In this perspective, cooperation with the universities is the better choice for HISP. However, such cooperation is not enough as the product (e.g. a particular version of the DHIS, a specific methodology, or a customized solution for a HIS or HMIS) - whether new or old, good or bad – is dependent upon testing in the field before the users can decide whether to accept it or discard it. So, the HISP needs the cooperation of the administration of the health department, such as the Ministry of Health, provincial Health Services, and districts.

It is important to know when and how such cooperation or relations will function well. In my opinion, cooperation with universities should be the first choice; then later, the programme could be coordinated with the administrative users. There are gaps between the former (cooperation with the university) and the latter (cooperation with the Health Units) and, as a consequence, product-building, product-testing, product-maintenance, and so on, will take more time.

Was the solution DHIS2?

There were two possible approaches to the problems encountered. Sooner or later the problems needed solving. So either we stay with the project until the problems are solved, or we abandon the project and try to find more beneficial and promising solutions.

And the second approach was the one that we adopted for the TT Hue project in 2006 when we decided to replace DHIS1.4 with the DHIS2.0. The DHIS2.0 was accepted basically for its promise of DHIS2.0's Java-based platform and open-source technologies such as Hibernate, Junit, and Webwork. The DHIS1.4 is a MS Access-based platform (requiring Microsoft licenses in the near future) with Visual Basic modules. At the time, the HISP local team in HCM City was using the DHIS2.0, preparing the implementation with the support of Norwegian graduate students from the University of Oslo.

The Vietnamese teams were then cooperating to prepare for the DHIS2.0 to be implemented into the field. The developers and facilitators were trained in the new open-source technologies being used by the DHIS2.0: how to download/check out the code, how to build the source code, how to use the data compiled for local needs - both online and offline - with support from the graduate students from UiO via emails (e.g.: mailing lists, wiki pages, etc.). The facilitators and the developers were eager to learn about the field experience and get feedback and comments, but unfortunately the feedback was scarce and time-consuming as the local teams were not too cooperative during this period.

How was DHIS2 implemented?

The DHIS2.0 was piloted first in HCM City and produced two reports for the Mother and Child Health Care Center with a view to supporting Mother and Child Health Care Centers in various districts. Then national reports (15 report forms numbered from 1 to 15) were added, so that by the end of the year, three report forms had been generated: No. 9, 10, 11. The reports and user manuals were also initiated with the new version. The DHIS1.4 and DHIS2.0 are both versions of the DHIS, yet there are many differences between them both in terms of system requirements and interface. The DHIS2.0 requires more RAM and its interface is more user-friendly, but it was new, so we needed to retrain the staff.

The role of Statistic and Planning in a HIS/HMIS

There are many problems related to the efforts made to improve the awareness about the usefulness of statistical data/information.

So, where is the core of the problem? And how do we solve it? What is the role of Statistics and Planning in a HIS/HMIS?

For me, the main problems are related to human resources or people. The main hurdles are:

- A lack of awareness of the utility of using data/information for report generation from the top level to the bottom (i.e. from national level to the ward and municipal level). Some of the people involved claimed that because the Statistics and Planning Department is a part of the health system they only need procedures.
- The expensiveness of training and re-training of health officers and workers at the health units, against a modest Health Department budget. The truth is that the MoH cannot afford the training or the replacement of equipment but is willing to waste money every year on tons of rather useless reports. This is a point that the health authorities should take into consideration.
- The possible closing of the Statistics and Planning Department, because of the cost and because the department is considered inconsequential. The authorities argue that the department collects data/information which does not belong to the Statistics and Planning Department, but rather to the hospitals or some other faculty/department. They need to reconsider this position, because they are wrong when they say that the Statistics and Planning Department is useless. This claim is explained by the incorrect use of the equipment and negative attitudes towards the project. Maybe they just want to find an excuse for not being involved (These were comments of the M2 manager of HCM City team in 2008, when he explained the report system in Vietnam. He also added that a health officer from MoH agreed with him.)

5.3.2. The case of HCM city

Possible consequences of the workshop and conference in VungTau city in 2008

The local HISP team struggled at the workshop/conference, trying to introduce and train officers from many provinces under very difficult conditions. The software did not yet have a complete report function and we were unable to show the output to trainees and convince them of the utility of the system. So what was the workshop/conference *for* if the organizational and technical aspects were not ready?

Many of the health managers and health officers who attended the workshop/conference were displeased or disappointed because they had expected a well-organized international workshop/conference. Many had travelled a long way from their province to Vung Tau City, and all they could see was an incomplete version of the HIS Programme and the promise of subsequent improvements. They were eager to learn but the workshop/conference did not instil the trust needed or give them a reason to report and persuade their managers to consider a pilot system. Clearly, this was a very difficult time for all of us – the manager (M2), the members and me. Because no-one had prepared and calculated the possibilities and backup solutions, things went wrong and out of control. “An expensive lesson for the local team” was a comment from a local member.

Medisoft was also invited to the conference, both an advantage and a disadvantage for HISP at the time. Medisoft or CyberMedisoft Company already have their own brand-names in

Vietnam and a reputation to protect. Their “*Total Hospital Information System (THIS) has been developed with the objective of streamlining the hospital information flow of a patient in the hospital, while allowing managers, doctors and other staff to perform their peak ability, in an optimized and efficient manner*” (from <http://www.cybermedisoft.com/>).

Nevertheless, Medisoft's participation carried the conference in many ways. Neither DHIS2 nor OpenEPR had made an impact on the implementation of the pilot project in the districts and could not even show a demo for potential new users at the conference. In comparison with Medisoft, the DHIS2/OpenEPR were clearly at a disadvantage.

The goals of and the investment in the local conference and workshop were not clear and well-defined. As a result, Medisoft was amply promoted and the reputé of the HISP (or DHIS) was reduced to nothing.

What did the September incident mean?

In order to have a proper answer to this question we must go back to the first days of HISP in Vietnam generally and in HCM City particularly.

The HISP project was initiated by the provincial health authorities in TT Hue and Hanoi, and an order for implementation was issued. In HCM City, things were different because HISP sought cooperation with the Mother and Child Health Care Center and not with the Health Services of the City.

Why the approach was different was explained to me by the former M1 manager of HISP Vietnam:

- First, when the HISP was launched in Vietnam, the approaches of the DHIS system with open-source technology and visions of HISP of a Health Information System reflected the Millennium Goals - UNMDG for the Mother and Child Health Care Programme, expanding the immunization programme among others. The Mother and Child Health Care Center in HCM City was, of course, their first choice at the time, as they had no idea about the 15 national report forms.
- The health schemes in HCM City are very broad so the report forms are more much complicated than those of other provinces or cities and do not follow the national forms issued by the MoH.

The first pilot projects and implementations of the DHIS1.3 were launched in the late 2004. The conflict between the data gathered and the data used had just emerged in the second half of 2008 on account of the poor utilization of the data and lacking reports. What the HISP project had done so far was train people in how to use the computers or computerizing the health field and introducing a HIS from other countries with a lot of promises for the future, but with little palpable benefits for the current users. The fact that the DHIS software had not yet been approved in Vietnam after nearly 4 years of trial was not a good sign. The situation will continue to persist if the issues inside the local team are not solved (e.g. the relationship between the managers and the team members).

A lesson for OpenEPR customization in Vietnam

OpenEPR is the software that generates others and automated arising management software for end-user. Open EPR is built on the idea to allow people (no need to know programming) to possess management application for their own needs without the software company. It is based on PHP language and MySQL database, open source, and it can run on any platform and through the desktop, LAN, WAN, Internet, and WAP.

OpenEPR is used to create:

- Management Software Coupon child health network of health care including child care center health products (Health Services of Ho Chi Minh city), 38 clinics in the ward District 4 and District Thanh Binh (Ho Chi Minh city).
- Software reported health of children in 24 health center districts and hospitals in the city.
- Software reporting health statistics form 15 countries are deployed in the provinces of Thua Thien - Hue (more information about OpenEPR at: <http://hocmon.blogdns.net/hispvietnam>)

The motivation for HISP Vietnam in 2007 to develop and implement OpenEPR customization was that the technology and outputs of the system are simple, and user-oriented. DHIS2.0 at the time could not fully support data-input and the reporting-solutions for the report systems. And OpenEPR can generate application for patient-record management for the health center and hospital.

The idea of OpenEPR is good, but the way it was developed and implemented has some issues as the implement team was not well-enough prepared to deal with trouble-shooting relating to the technology and the implement strategy. There were some issues of technology when OpenEPR was applied at a health center, especially as regards the patient-record application, data security, performance (speed of the commands), and backup solution for the database. Moreover, the strategy for implementing lacked many important points. For example, post-implementation was almost ignored, the users gave feedback and needed support. The response from the team and the manager were inadequate (at this time manager M2 was responsible for HISP Vietnam and he also the creator of OpenEPR customization for Vietnam).

“OpenEPR has been applied for the child health care programme since April 2007 in HCM City. OpenEPR was used for patient management. Then in September 2007, OpenEPR was customized for 15 national report forms and tried implemented in Hue City under the name of DHIS2+ although there is no relation to the DHIS2 technologies. The OpenEPR implementation failed in the TT Hue Province because it does not meet the needs of the users and is not connected with the local field.

OpenEPR has been used by the Mother and Child Health Care Center for more than a year. In late 2008, owing to lacking supports and troubleshooting they (the manager of the center’s IT department) are planning to use MS Excel for part of the Child programme and Hospital Fees, just like before.” (Comments from a member of HISP Vietnam)

Clearly, both the technical and social aspects are key to solving the problems. Implementing an Information System (or even a HIS/HMIS) involves more than installing, training, and maintaining a technical system. It also entails delving into more complicated and sensitive human-resource management and interpersonal relationships. Obtaining a consensus within

the local team is often difficult. Following up feedback and comments is absolutely necessary to the successful implementation of a system or at least for having it accepted and adopted.

5. 4. Discuss of the two cases with Gap Closure Technique (Heeks, Mundy, and Salazar, 1999).

Going through the cases; some techniques from the list above should be more in focus: GCT1, GCT2, GCT4, GCT6, and GCT7 in order to explore the cases more in-depth.

5.4.1. GCT1: Legitimizing and mapping organizational reality

The fieldwork in HCM City happened in the span of three months. This fact became one of the main issues as there was no pre-understanding of the field or the needs of the users or the importance of proper feedback. This goes for both the DHIS2 and OpenEPR.

Without cooperation between the developers and the users beforehand, there is no flow of information and the development of a suitable and useful IS becomes difficult. Runnability and workability from the view of the developers do not guarantee the acceptance of an Information System (especially a HIS, which requires much effort and user feedback before it can be adapted).

When introducing and piloting the system, the basic functions needed of a HIS are data entry, entered-data assessment, and the export of reports with calculated/analyzed information for a field demo report form. What happened during the workshop and conference in Vung Tau in August was illustrative of the problems encountered.

Workshop and Conference at Vung Tau city in August 2008

Preparation:

When preparing for the conference and workshop, the two members had no detailed knowledge about the schedules or the plans, except maybe the M2 manager. Everything seemed rather randomly organized: even booking a room at the conference for the demonstration of the HISP and DHIS to health managers and health officers from various provinces was difficult, and the computer rooms in which the training of potential users from provinces was to take place were two not well-equipped internet café shops in Vung Tau City! That was the workshop for DHIS2 users.

We all went together to Vung Tau, but during the three days there, the local team had no ideas about what the developers and facilitators from the other countries were doing. The organization of the workshop was amateurish, lacking in information from both the local and the global teams.

No information beforehand

The fact that the local team only counted three members made me feel embarrassed. The local team consisted of the M2 manager, the developer, and the facilitator. Two locations for training people in the use of DHIS2 with customized report-modules had been set up, so I had to join in the training, as two people were required for each location. I only got to know about

this the night before the training day. I found the attitude careless and impolite. No-one informed me so that I could prepare or at least have a look at the equipment. Again, I felt as a stupid lone ranger when the trainees asked about the customized report-generator, which I had never seen before.

The system was introduced at the workshop with basic problems

I figured out that the tool did not work properly. The trainees wanted to see very simple outcomes, such as the automatic counting of the total according to time. The developer and the M2 manager did not agree with each other. The developer had developed the tool, but the M2 manager had no ideas how to use and manage it. They started screaming at each other and arguing about it. This became a daily problem, but should never have happened while users/trainees were present.

Understanding the reality is very important in order to make the right and appropriate decisions for software design and system implementation. The relationship between developers and the workers in the field (in which users, current status of the system and the needs of changes, etc. are taken into consideration) is essential to success. Legitimizing and mapping the organizational reality can help to fill all the gaps, such as Information, Technology, Processes, Objectives and values, Staffing and skills, Management and Structures, and Other resources (money and time).

In the case of HCM City in 2008, if the local team (especially M2) had been adequately informed and had understood the field, the issues would have been avoided. The technology gap, reflected in the lack of preparedness and efficient support, can be closed if the field is carefully examined and assessed before implementation.

5.4.2. GCT2: Reality-supporting not rationality-imposing applications

The implementation of a HIS is not just applying a computer programme designed somewhere else without taking account of the capacities of the local users/receivers and the possible benefits of the system to the local health units. This technique insists on the utility of the application and the need for a solution that fits the local organizational reality. A good approach to installation and implementation can effectively close some of the following gaps: Information, Technology, Processes, Objectives and values, Staffing and skills, and Other resources (money and time).

During the 4th quarter of 2006, many problems arose in the TT Hue Province because of the health workers. Human resources were not stable. Often, the health worker in one district was redeployed to another department, or the health worker was on vacation, etc.

When did the problem appear?

Human resources seemed very unpredictable, and the health services officer claimed this was so because the country's health system lacked consideration for the importance of statistics in health management. That "people come and go" has become normal, he claimed, and without a stable human-resource distribution in the health system, especially in the Statistics and Planning Department, planning and decision-making had become inefficient. These problems

seem to have been tolerated for a long time. Nobody seems to care whether the data or information from the department (Statistics and Planning) is used and referenced or not. When I asked for an explanation, all I got was silence.

I did get a chance to join a national conference held by the Statistics and Planning Departments in Hue City early that same year, and I raised the same questions as above, but received no satisfactory answers. So, what about the figures, the information pertaining to the status of the health system of Vietnam or of a Vietnamese province in the newspapers or on TV? Where did the figures come from?

Suddenly, the officer of the Health Services of TT Hue explained that these numbers came from international UNICEF and WHO projects and that the data/information in national reports is used only for referential purposes. I could get additional confirmation by calling the local departments. When calling to confirm the data/information in the report received from the districts or when calling to ask for local data from international projects, I did not receive much. I was merely a witness while working for the Health Services of TT Hue.

This sounds very odd; however, this is how things functioned. I was disappointed, because this way of functioning jeopardized the implementation of the software, and the intended outcome of the project – an improved and useful health information system – had been thwarted.

The reality supported by the local team (and HISP project) did not make any impact, because the current health system (or rather, the health reporting system) and its many segments were not aware of the importance of the DHIS system. Their resistance was compounded by the fact that the DHIS system (all three versions) did not match their true needs for report generation.

DHIS: potential and reality

In a general system or in a HIS, technology is a fundamental factor that plays a decisive role in the success or failure of a system. There is fierce competition between projects in the various countries. The acceptance of one particular programme depends on the compatibility between the technology and the Information and Communication Technologies (ICT) used in a country. For this reason, the DHIS 2.0 of HISP can promise the extension and the transference of technology from developed to developing countries owing to its open-source software (OSS) approach. Obviously, OSS has great potential in the advancement of developing countries.

But for the cases in Vietnam, the potential for development remains hypothetical, not real. Even though the managers, health officers/workers, facilitators, developers, and co-coordinators of the projects are aware of the benefits and advantages of an OSS system, they were discouraged by the incomplete DHIS 2.0 version. The core requirement of a system is not only the promise of future potential but also applicability in the present. Developing countries do not have the funds for long-term investments and need affordable stable and ready-to-use products. Nevertheless, the need for training in the programmes' use is as great as ever.

Why not use a complete system from somewhere else in particular cases? The term “complete” relays the relative meaning of “it can work now and provide basic results”. It does not mean a finished system that does not require any updates or reconfiguration after implementation. The implementation of programmes has many phases and steps, the first being introducing a prototype from somewhere, the second exploring the use and getting feedback from the field in the form of users’ comments and suggestions. The third step is changing / adapting / improving the system to meet the end users’ needs; the fourth consist in applying the outcome of the third phases to the field to get yet more feedback... etc. The circle continues with phases third and fourth until the system can satisfy the needs of users in each specific user field.

Implementing and applying technology to the field is an ongoing process and heavily influenced by the users and the local context (social, culture, and political factors). The people carrying out or participating in the tasks are the facilitators, developers, and co-coordinators.

Adopting technology and making use of it was also a problem in the two projects studied, as seen from the side of the organization.

According to Land (1992), it is clear that ‘the management of the implementation process’ and ‘technology itself’ were factors not carried out successfully. The risk of failure was high.

The study “Reality-supporting not rationality-imposing applications” can help to solve the Technology, Objectives and values, and Staffing and skills gap. The lack of effectiveness seen in the DHIS application created a barrier between conception, reality and use. Or we were not persuasive enough. The current reality – with many issues relating to the objectives and attitude (mainly on a management level) and the skills of the staff (e.g., the health workers) – must be taken into consideration.

5.4.3. GCT4: Change agents

For a HIS, both in terms of design and in reality, change agents are the decisive factors which can motivate or prevent the development and implementation of a project. Change agents influence the progress and include factors such as the manager, the director or the Ministry of Health, motivation, decisions, policies, and strategies. When the project is launched, the role of the manager of the implementation team is just as important as the relations and level of communication within the team.

So, a ‘change-agent’ approach can close the gap of ‘Objectives and values’, ‘Management and structure’, and Other resources (money and time).

Lack of preparation and cooperation between the managerial levels of HISP Vietnam and the districts was a major hurdle. There were no or few pre-announcements as regards plans, task lists, and so on, from the manager of HISP Vietnam to the districts and province when the field was explored and the DHIS software was piloted. For the story of Can Tho Province, see 5.4.4.

As the result, the two team members were exhausted after their visit to Can Tho and they complained to M2, but they got no sympathy or encouragement from him, only criticism. Again, the lack of consensus between the M2 manager and the team members was evident.

The local team did not have many “interdependent activities, actors, or resources”. There were differences in conceptualization and problem-solving goals, ideas, and strategies. The disagreement between M2 and the team members lasted for a long time – and the private character of the conflict affected the common goals of the team. This represented a risk, as the members had become detached from their work - free agents that did not dare suggest ideas for how to make the project go forward.

When I was with the team as an inter-student, more or less a regular member, the members easily told me about their ideas, thoughts and even possible solutions. Now, if I asked them why they were no longer willing to share their thoughts and ideas with M2, they replied that they already shared their views but that it was of no use for a number of reasons ... mainly that they did not trust the manager. This was very unfortunate for the local team at that time.

Saying this, I do not mean to criticize anyone but I realize that I have learnt a lesson. It does not hurt to take a step back before taking a step forward. Every cloud has a silver lining. The present local team now includes both old and new members and are cooperating and trying to improve their professional working-style day by day. The reasons for this changed attitude are regular visits from the global HISP coordinator and team members, who wish to assist the local team.

The management issues in both projects can be summarized as a lack of analysis, follow-up, and timely problem solving – as experienced by the implementation team when the DHIS was implemented, and as illustrated by the case in HCM City in 2008.

For any project, the first steps are really important when it comes to convincing the participants (health managers, officers, and workers) of the benefits of system. Especially if the system requires periodical changes or is time-consuming for the participants. Or when a new computerized system replaces a paper-based system as was the case in the TT Hue Province. Unfortunately, the incomplete prototype of the DHIS system and the careless handling of the implementation and post-implementation of the DHIS 2.0 late in 2007 had a negative effect on the project's general progress.

The same thing happened with the DHIS1.4 in 2006: after more than one year of implementation, the DHIS1.4 did not show much improvement in terms of technique or use. The local health managers at provincial and district levels considered the DHIS 1.4 as a pilot project in TT Hue and what they actually needed was an improvement of their existing report system. None of these needs were met at the time.

The problems stemmed from the local manager?

During the HISP workshop in August, much time was spent persuading the M2 manager that the current DHIS2 can generate reports appropriately and usefully for users and that the performance of the management would be improve with the Open Health analysis tool. The system would facilitate the organization of meetings between HISP representatives, local

managers and members, the managers of the Mother and Child Health Care Center (MCHC), and the people involved at the various levels (e.g. the former local manager M1). The current issues relating to OpenEPR and DHIS2 were discussed and negotiated.

Then the agreement was drawn up and the responsibilities of the local team established, as well as the support from the global team and the MCHC. Preparations were made for the re-implementation of the system in a few months.

At the time, HISP recruited two new members for the local team because WHO is interested in supporting HISP Vietnam to improve the use of the OH analyzing tool. The presence of the global team partly solved the problems arising from the disagreement between the local M2 manager and the local developer about sensitive points such as taxes, salary, idea-ownership, trust, confirmation, and contracts.

For example, one of the team members sent me an email that he had received from the M2 manager, about salaries and taxes. There were conflicts between them about these, for example: the wrong way to calculate salary for the members. Even M2 emailed and replied to the members (developer and facilitator); the problem was not really solved.

One day later in August 2008, I received a forwarded email about the financial plan including my salary and other expenses. In the email, the team member wanted me to know that he'd paid a different sum than the one mentioned by the M2 manager. He then added that the team just consisted of three members: the M2 manager and the two developers. Why the M2 manager listed more members, he had no idea. But he was very angry for that. He added: "I do not trust the current M2 manager at all".

He also asked me for forwarding the email to the research fellow of HISP – at that time in HCM City for workshop – in order to inform him that he and the other local facilitator just receive: US\$300 and US\$150 (*although US\$ 350 and US\$200 are mentioned above*). After reading the forwarded email and the developer's comments, I appreciated the problems within the team and understood that they had become quite serious.

The developer of the team at that time was developing his GIS module which has been adopted and used in India. This developer maintained that because of his limited English, the communication between the local and the global team was mainly a thing between the global coordinator and the M2 manager, who claimed to be behind the module. And the developer doubted that the M2 manager told the global team and the coordinator that the idea of GIS was the developer's idea.

So, owing to the lack of communication within the local team and no frequently contacts with the global team, the subjective opinions of M2 (see section 5.0) about the DHIS2 and the technologies involved in the implementing decisions were given special consideration whereas the rest of the team – including a facilitator and a developer – hesitated to give their ideas and opinions until the global workshop of HISP in HCM City in August 2008.

During the HISP workshop in August 2008 in Vietnam, the developer finally got a chance to tell the team about the situation. After that, he was very happy because his efforts were acknowledged by the team. Then the contracts were also drawn up for the two current members and the two new members. This meant that the employees had been working for

HISP for at least 2 years (in the case of the two current members) without a signed contract. That may seem unbelievable but it is true.

After the workshop?

When the global HISP team left, the brand new local team included seven members: the M2 manager, the former M1 manager (who left the manager position to become a consultant of HISP Vietnam in 2007, because at that time the new manager was back, very busy with his research and teaching at Health Training Center of HCM City. See section 5.0), one developer, one facilitator, two new members, and of course me as a HISP inter-student. The team worked on the Mother and Child report forms with the DHIS2, using BIRT (Business Intelligence and Reporting Tools) to generate report designs and to export different report file formats (.pdf, .doc, .xls, and html using the DHIS2's report module).

As stated before, the issues relating to the M2 manager were partly solved during the HISP workshop, but once the global team left, things did not seem any better. The manager rarely looked at the system and its new technologies or functions or inquired about the new members or the others and what they were doing. He soon seemed to lose interest in his team.

During these days, my work consisted mainly in encouraging the team (both the old and new members) and in training them in the basic knowledge of a HIS/HMIS and DHIS2 software. We discussed the team's working style, and they emailed me when they were having doubts or questions. I was after all familiar with the HISP wiki page, how to download and build the DHIS2 code, and so on. It was nice to see that they were all eager to learn and work together despite the disinterest of the M2 manager (they were required to make reports about their tasks every week to help the M2 manager monitor the team, but they also did this to get instructions and confirmation from the others, especially from M2, even though he never gave any feedback).

In my opinion, the new members more than anytime needed help and instructions from the more experienced team members in order to adapt to the team and be motivated to continue working.

Is Team work and follow-ups necessary?

Follow-up of the team is important during the implementation of the programme, both in terms of monitoring for timely and adequate support and encouraging and training/giving feedback on the members' tasks, especially when you have new team members.

Unfortunately, M2 did not think that supporting the team both technically and on a managerial level was part of his job description. As a result, I was reluctantly obliged to monitor the performance of my team colleagues, even though I was just an intern-student. I had gotten several friends on the team and I wanted to help them if I could.

The main changes in the team happened in November after a visit from the coordinator for HISP Vietnam. The coordinator took on a heavier voice when speaking to M2 than he had done during the August 2008 workshop. The other members of the team also had a chance to express their opinions, ideas, and even disagreement. I had interviewed the members about

the recent improvements and they all agreed that although the first visits from HISP in August was important in that it allowed the field to see the existing problems, the coordinator's second visit played a decisive role and had a positive impact on the team in terms of encouragement, feedback, and training. The staffing plan for HISP Vietnam team has been changed, and the former M1 manager will come back to take care the local team and be a consultant for the project. He will be in charge of cooperation, communication and the implementation of the DHIS2.0. The current M2 manager, who completed his Master's at the University of Oslo, will leave the team to continue his study as a PhD student sometime in 2009.

The role of the local team's coordinator is important in order to have the right and timely solutions for the local problems. Follow-ups with a few visits yearly are not really efficient if the problems of the field and the local teams are not visible to a distant coordinator.

The implementation process is not just about training. It gives the users a lot of problems without any advance notice. A merchant must handle customer concerns after purchasing. If you ignore the clients in the post-implementation phase, you and your business will be excluded from the market sooner or later.

The DHIS 2.0 is the product of an international initiative and free of charge for the users!

So, what is the point I am making?

The truth is that internationally sponsored projects have their own opponents and competitors. A free computer system and software are no less useful or interesting because the developing countries lack important skills and facilities. The success and usefulness of new technologies depend on training, support, maintenance, and the right attitudes from the technology providers.

The 'Change agent' takes on an important role in the projects studied, especially so in the case of HCM City during my intensive fieldwork. Through all the stories and discussions, I have learnt a lot and understood that the most important element for a project and its implementation is the manager. And the best change agent is an agent-mediator who can impose changes in positive ways.

To be a manager is not easy and simple. You cannot order members to do whatever you want without consulting them, listen to their ideas. You cannot treat them disrespectfully. Following the HISP organizational restructuring, the local manager now monitors and coordinates the local tasks – he does not order people around or impose his decisions without discussion. Trust and consensus among the team members are the strength and motivation of the whole local team. You cannot be a good manager with unhappy team members.

The story above reflects the big issues inside the implement team and they stem from the management level and affect the relations within the team (mainly between the manager and the team members). And understanding the change agents can help you analyse a project and its effectiveness. In this particular case, the attitude and working habits of the M2 manager of the local team, his policies and strategies were broken down and examined.

5.4.4. GCT6: Participation

The importance of a participatory management style and a global understanding of the stakeholders in the design of new computerized community programmes are not new parameters, but they are vital to the understanding of individual cases (especially the case of HCM City). The gaps Processes, Objectives and values, Management and structures, and Other resources (money and time) can be of significant importance.

Since December, the DHIS2 with BIRT as a report generator has been implemented in some pilot districts in Can Tho Province and has received positive feedback from the users. The first steps of the process were a bit confusing, as there were no predictions about the local field before introducing and piloting the system.

Now the team members are continuing to explore the field. They visit the local fields and identify the different report systems used by the various districts. Because the implementation is costly and time-consuming and because the various districts have different report forms and requirements, it is absolutely necessary to do it in this way.

The lessons learned from the first exploring steps in the Can Tho Province in late October (2008) illustrate how carelessness, lack of basic information, random planning, connections, predictions, preparation and so on can affect the implementation in the field. The October incident – on the decision of the M2 manager – resulted in two members (1 developer and 1 facilitator) being assigned to the Can Tho Province in order to introduce the DHIS2 in some districts.

The relations between local team, the field (users, practitioners, etc.), and global team

The local, global and the field levels are the three main contributing factors in the development and implementation of a HIS/HMIS in particular and of an OSS in general.

As for the case in HCM City, the local capacity is limited by both human resources and technology. The support from the global team is not always timely and useful if there is still an invisible “wall” between the local and the global developers, and an inadequate flow of information between the local, the field and the global levels. A typical example from the HCM case is that the local developer in HCM City had become more active and wanted to share with and learn from the community (setting up mailing lists, wiki pages, etc.) after being confirmed by the global team which acknowledged his efforts on behalf of and contribution to the local and global levels.

The social aspects are all ubiquitously important, because we are after all human beings with an independent mind and individual characters. It is important to be willing to compromise and moderate the differences in order to build a healthy community full of joy and positive aspirations. The global team cannot ensure adequate information from the local or the field levels and vice versa all the time. Geographic distance and language are invisible barriers in much the same way as the visible physical hurdles.

The lack of cooperation and mutual participation of users, developers, and implementers were a problem, as we have seen above. This has been clearly demonstrated in the case of HCM City, whereas in the TT Hue Province – between 2004 and the early 2007 – this was not an issue when the first versions of the software were introduced. However, when the DHIS2 web application was launched in the TT Hue Province, owing to a number of reasons, the local team gave it a cool reception and the national team in HCM City took control.

Cooperation and communication between the developers and the field team (health managers, health officers, and health workers, etc.) were largely ignored. The health officer of the TT Hue Province told me that the M2 manager of HISP Vietnam offered *her* manager (the chief of Financial Planning Department) a customized OpenEPR application. If this were to be implemented, fees would be required. The local Health Services of the TT Hue Province – in view of the Statistics and Financial Planning Department's very restricted budget – refused the offer. The officer believed that this could be the reason why the HISP team were not interested in implementing the DHIS in the TT Hue Province.

In this sub-section, the participative approach has been expanded with a number of possible relationships, such as those between developers and users, between designers and participants, between local and global team members, and between the implementation team manager and the health manager. Such openness is necessary to solve and close the gaps listed.

In my study, the Management and structures gap is the more dominant factor. The information system should be owned by the Ministry of Health or by the local managers or by the donors. Today, the adoption of a software programme often depends on the users and owners, not on the developers or designers.

5.4.5. GCT7: Hybridization

Knowledge of Information System and Information Technology is a basic requirement for the participants or users of a HIS. Computer skills are essential in a health care context when you want to narrow the gap between Staffing and skills and Other resources (money and time).

The disadvantages for the developers and designers for these jobs reside in the required understanding of data elements, indicators, and parameters that relate to the field of health statistics – or rather, the lack of such understanding among the people involved. The definitions and formulas of the indicators are at the heart of a HIS/HMIS.

Health statisticians in the districts are not trained to generate reports and other statistical tools. They are sometimes very reluctant and unwilling to invest time and effort into understanding the health data parameters and indicators used by the system.

While HISP is making an effort to support and implement a HIS/HMIS for data collection in order to have a statistical tool with which to improve and develop the health care system, the use of statistical health data/information has not yet been getting enough attention from the local health units. In some ways, this is the main lacuna or weakness of the health system.

To implement a computer-based HIS, hybridization – an approach that aims at combining computer skills and knowledge about the health system and health data collection – is necessary. When the two projects were launched in 2004, much time and effort were spent by development team to make such hybridization happen.

In order to achieve an in-depth understanding of the cases of TT Hue Province and HCM City, Gap Closure techniques 1, 2, 4, 6, and 7 have been utilized. When the cases were broken down and analysed from a gap closing perspective, they were not only described (e.g. did we use the techniques consciously or unconsciously), but the practical lessons and information garnered were also brought up. The fact that the HISP project could not be continued in the TT Hue Province in the late 2008 or that the problems with HISP Vietnam in HCM City occurred at the same time were not a coincidence. The failure of the projects was the inevitable result of inadequate policies and flimsy implementation strategies put forward by the local team in particular and the lack of follow-up by the global team in general.

5.5. Comparative analysis of the two cases in Vietnam and with cases in other countries

5.5.1. The two cases in the TT Hue Province and HCM City

The DHIS project was launched at approximately the same time as the two cases, and embraced many of the same strategies. However, the outcomes in 2008 are different: the team in HCM City is still supported both technically and on a human resources level for the development and implementation of the project, while in the TT Hue Province, the DHIS (or HISP project) is largely ignored or down-right rejected.

The cases share common features: the implementation processes, the technical problems, many of the social aspects, team building, maintenance, etc.

However, there are some differences between the cases:

- The context: TT Hue Province and HCM City are different in terms of social and political context.

For example, in the TT Hue Province, the local authorities of any department, whether the health services or others, are still very conservative; whereas in HCM City, the private or the local official health departments are very open to change, new applications, cooperation, etc. The historical aspects can explain this difference. The traditional opposition between the South (the southern provinces and HCM City) and the North (the northern provinces and cities... from TT Hue to the northern part of Vietnam).

- HISP contacts and cooperates with local health services in different ways: in the TT Hue Province it cooperates with the Health Service of TT Hue and the administrative department.
-

In HCM City, it works with the health care centers, which deal with patients and health services directly. The number of health service administrations is lower in the south than in the north.

As a result, the Vietnamese HISP team has developed some extra applications for their target groups, albeit without adequate support and follow-up during the implementation stage and later. All are at risk of failure or abandonment by both the developers and users. Instead of seeing the national HISP team as an additional support, the local team was eager to take care of everything themselves, and so nothing can be achieved, not even the main mission – the development and implementation of the DHIS 2. This is an expensive lesson for the team in particular, but also a good indicator for other places/cases.

- The report systems used by the two Health Services are different. In the TT Hue Province, the national report forms are used at district and provincial level for statistical purposes: monthly, quarterly, six-monthly and yearly; although at the district level, national forms are not applied by all units.

In HCM City, most of the districts have their own report forms, even at the city level (HCM City, which is the biggest city of Vietnam and enjoys the same status as a province) national reports are not well-used.

The explanation that I got from the health workers in HCM City is that HCM City is a big city with a large population. As a result, the health issues are numerous and the national level cannot afford to deal with them all.

What about the case in Can Tho Province?

Again, the needs for data and national forms are not generally accepted.

When we look at the whole picture of the report system in the health service sector, we see that almost every province or district has its own customized forms for their routine work.

Consequently, a harmonized national health report system for the whole country is necessary!

Generally speaking, and despite the many similarities and differences of the systems, we must not forget that the cases are located in a Vietnamese context, i.e. in a developing country lacking infrastructure and skilled human resources, as well as technical equipment and effective management. The lessons learned are invaluable for future projects.

Here is a summary table for the cases in TT Hue Province and HCM City:

Elements	TT Hue Province	HCM City
Time: 2004-2008	The local team was active between 2004-2007	The local team has existed since 2004.
Social context	Formal, bureaucratic	Informal, flexible
Partners	Health Services of the Province: various administrative units	Mother and Child Health Care center: various professional and functional units
Report system	15 national report forms	Many local report forms, national reports are less in use.
The effects of HISP since 2004	+ Computerization of health units at district level; Improved awareness among health officers/users of health data. + no concrete outcomes	+ Improved awareness among health officers/users of health data. +DHIS 2.0 was used to make reports for the Center and for lower units at district level in the late 2006 and early 2007.
Others	Lack of communication and follow-up, the HISP project could not continue in late 2008.	The need for a patient-record system at the Center and more technical support for the local users.

Table 5.5.1. The cases of HISP in Vietnam (TT Hue Province and HCM City)

Referring back to the gaps in **Table 5.2**, we see that the TT Hue Province project presented five gaps: Information, Technology, Processes, Objectives and values, Staffing and skills, and Other resources (money and time) while there is only one gap - Objectives and values – in the case of HCM City.

Why this difference? And what does it say anything about the projects?

The difference of outcome lies in the timeline. While the case of the TT Hue Province stretches over a period of four years (2004-2008), the HCM City project covers only one year (2008). Moreover, while three versions of the DHIS (1.3, 1.4 and 2.0) were implemented in the TT Hue Province, only the DHIS 2.0 has been implemented in HCM City so far (the DHIS 1.3 was indeed piloted in HCM City in 2004 and in 2005, but I was not able to collect much in-depth information about it).

The discussion of the cases has so far been based on my personal experience: my work as an inter-student. The general information I have garnered from the previous theses is not complete enough for an accurate comparison. In many respects, **Table 5.2** is relevant to both cases, but the timeline is different.

This means that when DHIS 2.0 was piloted in HCM City (DHIS1.3 in 2004), the 7 gaps (except Objectives and values) had to be kept in mind. However, in 2008, if we look at the social and technical problems encountered (*see 5.2 and 5.3.2 for the case of HCM City*) in the summer of the year, the Objectives and Values gap was the more dominant.

5.5.2. The other failure/success cases in the other countries

This section presents and analyzes the two cases mentioned by (Heeks, Mundy, and Salazar, 1999).

The first case was from a "Computer Link" scheme for 26 home-based AIDS patients, allowing them to keep in touch with each other individually and as participants in groups (Brennan and Ripich 1994).

The Computer Link application was judged by the participants as a success.

During six-month evaluation period, it was used 300 times by patients. And emails, forum were also used more than 10,000 times. The electronic encyclopedia of AIDS-related information was activated nearly 800 times (Heeks, Mundy, and Salazar, 1999, page 5).

The analysis scheme of seven dimensions of gaps (Heeks, Mundy, and Salazar 1999, p. 6), the case was successful owing to "the assumptions or conceptions underlying Computer Link's design were either matched to existing realities or required only very limited change along seven possible dimensions" (Heeks, Mundy, and Salazar 1999, page 5).

What are the seven dimensions?

They are: Information, Technology, Processes, Objectives and values, Staffing and skills, Management and structures, and Other resources (money and time).

Through the assessment of the case, the frequency plays an important role for the acceptance or adoption of the program, of HIS in particular and IS in general.

This finding is also compatible with what emerged from the cases in Vietnam. The health reports in the TT Hue Province are produced quarterly and streamed from district level to provincial level. This means that the frequency with which the users make use of the system is every three months or more. So, by the time the programme/system has been installed and people have been trained for it, the possibility that it will be used and adopted seems high.

The picture in HCM City now seems a bit more optimistic, as the reports and the information are analyzed and used monthly, at least at the Mother and Health Care Center (i.e. at an administrative city level) where the HISP offices have been located since 2005. This center urgently needs a patient-record system to manage the daily load of records from the district. It needs such a system more than it needs a statistical system like the one HISP can offer. This clearly demonstrates that there is indeed a gap between the developed system and the actual needs of the field.

So, the potential benefits of the software, THE DHIS1.4 or 2.0, are high, but the users need instant feedback and support from the local team in order to make the system work appropriately and to produce the expected outcomes, such as reports, calculated data or information support for decision-making. The DHIS at that time (from late 2004 to 2008) could not afford to implement the system with these requirements.

The second case was at a UK hospital attempting to introduce an expert system for computerized colonoscopy (Guah, 1998).

This system was initiated by technical staff and the conception-reality gaps were visible along a number of the ITPOSMO dimensions (Heeks, Mundy, and Salazar 1999, page 7):

Information: the expert system focused on statistical information on colonoscopy while this functionality was not demanded at the hospital.

Technology: the system required an advanced technological infrastructure while the current reality of the hospital could not afford.

Processes: human decision-making processes with coloscope very demanding in the current processes at the hospital. So, the automatic expert system was much critical.

Objectives and values: with the belief that human input remained important and recommended (and the staff was also scared of automation), the current objectives and values of the medical staff did not match well to the objectives and values of the expert system with the process automation.

Staffing and skills: the system was not easy for the hospital staff to use because the design conceptions did not match the capabilities: staff skills and their availabilities.

Management and structures: the gap of this dimension was also visible.

Other resources: the expert system required time and money to be used. And the current realities of the hospital could not follow.

The gaps along with the seven dimensions ITPOSMO were very clear while the expert system was introduced and piloted. And these gaps led to abandonment of the users and the project with an automatic expert system failed.

The functionalities of the “expert system” were not useful for the field because it did not meet the needs of the users. The infrastructure of the hospital could not afford the new technology. Also, the current manual working methods with their social aspects (e.g. trust, skills, motivation, and acceptance) could not follow the automated changes of the expert system, which required increasingly more time, money and effort from the staff.

The case in the UK was broken down into the SEVEN dimensions and analyzed thoroughly. Almost all of the gaps are involved.

As for the **Information** dimension, there are significant differences between the UK projects and those set up in Vietnam. In the UK hospital, the information system introduced was not much needed, whereas in Vietnam, the DHIS system was welcome, but not well adapted to the needs of the field.

As for the **Technology** dimension, the problem related to infrastructure in both UK and Vietnam. The UK hospital required powerful technological infrastructure and the DHIS (with three versions: DHIS 1.3, 1.4 and 2.0) in Vietnam needs an adequate computer systems to be implemented.

As for the **Processes** dimension, the gap experienced in the UK project was larger than that seen in Vietnam (especially when it comes to the case of the TT Hue Province). In the UK hospital, the automated expert system was designed to replace human decision-making. This did not work well in practice. In the TT Hue Province project, the change required by the DHIS system was also on the report-making level, but the software did not reflect the reality, i.e. the diversity of data collection methods and very dissimilar report forms.

As for the **Objectives and values** dimension, much of the same problems occurred (both in the UK and Vietnam). At the UK hospital, the medical staff were not ready to adopt the new system, because they feared automation and thought that human input remained crucial. The Vietnam project met with resistance and a lack of motivation (or adoption). The system did not perform well, and it was difficult to convince people that statistics could be beneficial to the decision-making process. The health manager and his staff were not really interested.

As for the **Staffing and skills** dimension, the expert system in the UK was a difficult system to use and the staff could did not master it well enough. In the case of the TT Hue Province, the DHIS software was not a difficult system to use, although it required basic computer skills and knowledge about the health field. So the barriers could have been overcome if more time and effort had been invested by the health staff and if they wanted to train and use the system (or if there had been more encouragement from the health managers to their health officers).

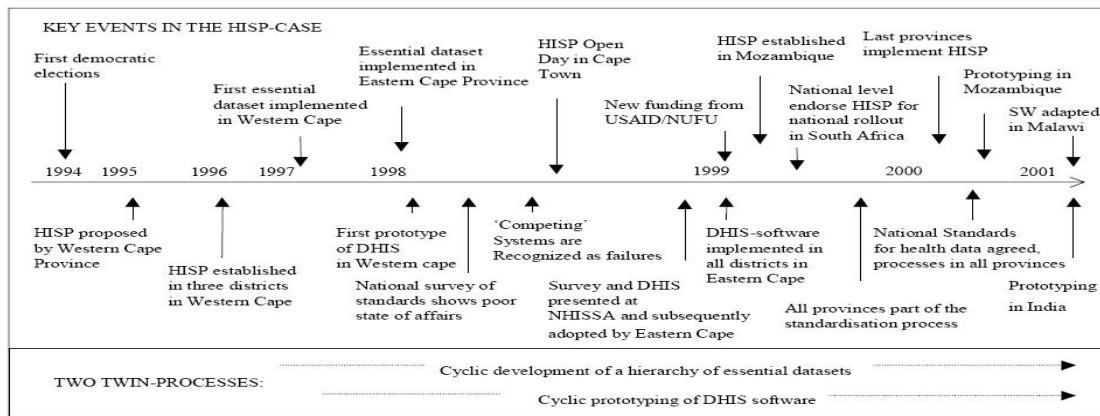
As for the **Management and structure** dimension, the UK hospital showed a gap whereas in the TT Hue Province and the HCM City projects, the gap was not that evident.

As for the **Other resources (money and time)** dimension, both the UK and the Vietnamese projects (mainly the TT Hue Province project) showed a discrepancy. In order to operate and make use of the system, more money and time were recommended. But these recommendations were not taken into consideration.

Through these (typical) cases of success and failure, I have focused on and analyzed the implementation of the system in Vietnam.

5.5.3. The case in South Africa with the Gap Closure Techniques.

First, the case of South Africa is described. And then, under the Gap Closure Techniques, the cases are discussed and compared in details with the cases in Vietnam.



A chronology of important events in the HISP case.

Figure 5.5.3. The KEY events in the HISP-case in South Africa (Braa & Hedberg, 2002, page 7)

In 1994, Strategic Management Teams were founded to reconstruct the health sector in all provinces in South Africa.

In early 1995, a pilot project to develop district health and management information systems was proposed by the sub-committee for the Strategic Management Team on Health Information Systems in the Western Cape Province. And this proposal got funding from the Norwegian Agency for Development Co-operation (NORAD) for a two- to three-year pilot project.

There are two phases of the project from 1996 to 2001: the pilot phase (1996-1998 including prototyping and implementation) and phase two (1999-2001) with national rollout, training and standardization (Braa & Hedberg 2002, pages 7-8).

The first phase (1996-1998):

1996: Three districts in and around Cape Town had been activated with one full-time district facilitator in each district and a project coordinator. The team was based at the two Cape Town Universities. The HISP team at that time included: University staff, activists from the health sector and NGOs and two Norwegian researchers with focus on identifying information needs and supporting interim district management teams. There were two main areas of research and implementation: (1) the development of Essential Data Sets and standards for primary health care data, and (2) the development of a District Health Information Software application supporting the implementation and use of such data sets.

1997: The first data set was implemented in all Local Government health facilities in the Cape Metropole (including HISP pilot districts), and later in the whole of Western Cape.

1998: The first version of the District Health Information Software (DHIS) was implemented and used to capture and analyze monthly data at district, regional and provincial levels in Western Cape. With the failure of the other software and IT projects, HISP had a chance to move on this project. In January 1998, a unified monthly report was implemented in all primary health care centers in the Eastern Cape Province. Beside the successful story of HISP, the Free State Province with the project based on scanning of individual tick-sheets from all patients' health services encounters with a large provincial budget and much attention got troubles and was abandoned.

In October 1998, there was an Open Day conference, seen as the successful wrap-up of this phase. Representatives from the national level were impressed by HISP and DHIS software and opened for a new meeting in Durban two weeks later. That meeting had a positive influence on the two processes. First, the presentation of the national survey of health information systems and essential data sets triggered a process towards a new national Essential Data Set, formally adopted in early 1999. Second, representatives from the Eastern Cape decided to switch to the DHIS software.

The 1998 data file for Eastern Cape were scheduled for implementation in all districts and a training session was to be held during November-December. The Norwegian University Council (NUFU) funded HISP for the period 1999-2001.

The second phase (1999-2001):

1999: Pilot projects were started in several provinces: KwaZulu-Natal, Mpumalanga, Northern Cape, and the North West Province. HISP is established in Mozambique as a collaborative effort between Universidade Eduardo Mondlane and the Ministry of Health.

2000: Business plans for the HISP rollout in South Africa are developed in each province, and the last three provinces begin implementation during the first or second quarters. Another five full-time trainers were hired and more programmer time was also purchased.

2001: The HISP rollout continues in all provinces and districts of South Africa, with data input coverage for the financial year (April 2000 to March 2001) reaching 95% - the highest known for any routine health information system in South Africa. The DHIS software is adopted by Malawi and piloting begins in several other developing countries. However, the funding issues still partly existed in 2001 (the same situation in 1998) for the following year.

As to the gap closing techniques used in the two phases in South Africa (1994-2001), the following were involved:

- + GCT1 (*Legitimizing and mapping organizational reality*), GCT2 (*Reality-supporting not rationality-imposing applications*), GCT6 (*Participation*): for the first phase (1994-1998).
- + GCT3 (*Customization to math realities*) and GCT8 (*Incrementalism*): for the second phase (1999-2001).

In 1998, the failure of two other software and IT projects helped better understand the health system and the existing needs in South Africa. GCT1 and GCT2 were the relevant methods used. Failure to properly understand the reality (electricity needs, required skills, etc.) resulted in the abandonment of the project. The failure led HISP to design a simpler application with less training requirements.

The failure to capture and analyse health data in primary health care centers (GCT 2) brought about real change and had an impact on HISP and its working methods at the time. While the previous system aimed to introduce a high-tech primary health care information system (based on the scanning of individual tick sheets from all patients' health services encounters in the Free State Province), the first versions of DHIS were implemented and applied for the monthly data collection in the districts and regional and provincial levels in Western Cape. The system did not require any changes to the existing technology.

The participation technique (GCT 6) was also used in the first phase of the HISP project in South Africa in 1998, and was show-cased when the Open Day conference was held. As a result, representatives from Eastern Cape decided to adopt the DHIS software. The DHIS data file was installed and implemented in all districts in Eastern Cape, and training sessions were held during November and December of 1998.

In the second phase of the South African project (1999-2001), a customized business plan for HISP was developed. With EQUITY/USAID fund, the national rollout in 2001-2002 allowed HISP to hire more trainers and programmers. So, technique GCT 3 was applied here.

If we divide the HISP project into two phases, the discrepancy between the reality and the design can be analyzed in light of the two phases, and the gap between the reality and conception can be diminished incrementally. This is known as *Incrementalism*. The two phases are Prototyping and implementation in one province' and National rollout of software, training, and standardisation. The District Health Information System (DHIS) was also developed and implemented in a succession of versions in which technology, design, and functionalities were gradually changed and improved in order to meet the needs of the users (e.g. : DHIS 0.9, 1.0, ..., 1.3).

Compared with the cases in Vietnam, the South African project was successful after 6 years of piloting, development, and implementation (from 1996 to 2001).

The gap-closing techniques (GCT 1, 2, 3, 6, 8) were used in the South African project with visible outcomes. IN Vietnam, however, techniques GCT 1, 2, 4, 6, 7 were applied in both the TT Hue Province and HCM City projects, but without the desired outcomes. When the DHIS was built and developed, the experience of two failed IT projects in 1998 were taken into account. This was a good opportunity for the HISP to push forward. During the same period (2004-2009), the projects in Vietnam remained in the initial phase.

Why?

Because the prototyping phase in Vietnam had taken too much time and the software was not much improved. Also, the people involved lacked awareness of the problems and the will to participate:

“No matter how good the design of an information system, it will not be effective unless there is internal desire, dedication and commitment of leadership to have an effective and efficient health service management system” (Chaulagai et al. 2005, p. 375).

The HISP is a research and educational project in which the developers mainly come from the universities of many countries (e.g. Norway, India, Nigeria). So, unlike other software products, the process of producing and developing the DHIS could not follow the local needs in a timely way considering the limited human resources at the disposal of the global team.

Generalization is also a main feature of the DHIS. The product is a basic version which needs customization in the field. Between 2006 and 2008, the very first phases of the DHIS2 product were launched as an unfinished and unstable prototype. But, since late 2008, the DHIS2 offers basic and stable software that can be customized at the local level. In the late 2008, the Vietnamese version of the DHIS2, based on the global packet, has been updated and piloted for use on a district level.

The following is as summary table of the projects and GCT method:

Gap Closure Techniques (GCT)	TT Hue province (2004-2008)	HCM city (2008)	South Africa (1998-2001)
1.Legitimizing and mapping organizational reality	Not used	Not used	Applied
2.Reality-supporting application	Not used	Not used	Applied
3.Customization	×	×	Applied
4.Change agent	Not used	Not used	×
5. End-user development	×	×	×
6. Participation	Not used	Not used	Applied
7. Hybridization	Applied	Applied	×
8.Incrementalism	×	×	Applied
9.Closing specific conception-reality gaps	×	×	×
10.Freezing dimensions of change	×	×	×

×: No data

Applied: be used (more or less)

Not used: Little or No use

Table 5.5.3: The cases in Vietnam and South Africa with Gap Closure Techniques

Chapter 6: Conclusion

Contents

- 6.1. Answers to the research questions
 - 6.2. Compare with the previous studies in Vietnam
 - 6.2.1. DHIS project in the previous studies
 - 6.2.2. The relations between the previous findings and the thesis
 - 6.4. Possible future research
-

6.1. *Answers to the research questions*

The first question: What are the challenges of developing and implementing a Health Information System in Vietnam (2004-2008)?

There are two main types of challenges applying to the projects carried out in Vietnam between 2004 and 2008:

- Developing and customizing the DHIS software: the Health report systems are very complicated and inharmonious. The bottom and top levels of public administration use different reporting systems and forms (from the ward to the provincial level). The DHIS technology could not support their needs as the local development team lacks the appropriate strategies and skills. In addition, communication is poor and the follow-up inadequate.
- Implementing the DHIS software: the health units lack proper infrastructure to install a HIS. The staff lack training in HIS and IT. The implementation team had problems with the manager. Communication and cooperation between the developers and the users in the field were almost nonexistent. The monitoring policies of the global coordinators were insufficient and ineffective.

Obviously, in such a context, the local team struggled to fulfil its two main tasks: developing and implementing the system.

The health report system and DHIS technological capacities (see section 5.1.1, 5.1.2 and 5.4.2):

The report system at the health units (at ward, district, and provincial levels) is complicated, because of the numerous types of reports and their calculation methods (or formulas). In order to acquire an understanding of the usefulness of good technical support, the users need more knowledge about the health information system (and of the data elements and indicators involved).

The main problems encountered were related to the generation of reports with the DHIS (version 1.3, 1.4, and 2.0). Calculating data elements and indicators was very tricky. The users sometimes did not follow normal procedures for calculating data elements within given time slots. For instance, the number of pregnant women in the third quarter of a year would be calculated simply by adding the numbers of the two previous quarters of that year... The DHIS technology prior to 2008 could not meet the reporting needs of the health systems (national reports or customized reports at the local province and districts). With the advanced system design of BIRT and the 'report table' feature in the 1008 version of DHIS2.0, the issues seem to have been fixed.

Implementing strategy (see section: 5.4.3 and 5.4.4):

The strategy applies to the implementation locally and the relations between the local and the global team. The insufficient implementation results and the inadequate communication (or

follow-up) by HISP Vietnam (between 2007 and 2008) are good examples. HISP international supports HISP Vietnam in its efforts to implement the DHIS report-generating software at district and provincial level (HCM City is at a provincial level just like TT Hue Province), but in 2007, the DHIS was not in used or implemented. The reasons I got from M2 and the team members when I first met them in August 2008 were that the DHIS2 software could not generate the reports that the users wanted, and the health managers at the health centers did not much care for reporting benefits.

So, M2's negative attitude towards the DHIS2 was evident. The DHIS2 was not updated until the HISP workshop in 2008 in which the latest DHIS2 technologies were introduced.

Infrastructure (see section: 5.1.3 and 5.1.6):

These issues mainly surfaced in the TT Hue province, where there are many districts with no computers for the Health Statistics Department. So, implementing a web application (such as DHIS2, which requires an Internet connection and an adequate computer system) like the one used in 2007 became a long-term project.

The pilot steps of DHIS1.3 and 1.4 in TT Hue province at some pilot districts (Huong Thuy district and Hue city) were possible because the districts had been supplied with computers.

Staff skills (see section: 5.1.5 and 5.4.5):

Even though the districts could be equipped with modern computers and functional software, teaching the staff the required skills to operate the system was always necessary. Especially when it comes to the health information system, the staff need both IT skills (basic knowledge of computer systems) and HIS skills (knowledge of the health sector and its needs, such as data elements, indicator, reports).

The Manager (see section: 5.4.3):

The manager – a person who can establish and influence the implementation of policies and strategies – is a change agent. If the manager has the right attitude and works to find positive solutions for the problems encountered during implementation and the local team building, the impact will be tangible. But if he or she does not have a proactive attitude, the progress of the project could be jeopardized. Unfortunately, the negative attitude of the HCM City HISP manager compromised the project. Things were partly solved by the end of 2008, but the consequences have been considerable. For example, HISP in the TT Hue Province could not be continued, owing to the manager's ignorance and unsupportive stance. By the end of 2008, the HISP Vietnam team still had conflicts and was still struggling with issues pertaining to responsibilities, obligations and rights.

Communication and cooperation (see section: 5.4.1 and 5.4.4):

Communication and cooperation aim at improving the relations between the users and the developers (both on a local and global level). In order to develop a supportive software application for the users, communication and cooperation are of vital importance.

Implementing a computer programme and training the users cannot be achieved simultaneously, and the process needs constant monitoring and follow-up. Training sessions must be repeated, people must be given the chance to try more than once. But the need for proper training was not taken seriously in the case of the TT Hue Province (in the late 2007) and in the case of Can Tho Province (in the late 2008, *see* 5.5.4).

Monitoring policies of the global towards the local (see section: 5.4.3 with the sub-section: *Is Team work and follow-ups necessary?*):

HISP is an international organization and the DHIS software (a product of HISP) has been introduced and implemented in many developing countries (including Vietnam) to develop a Health Information System that can generate health reports, analyze health data and improve decision making and the health system in general. However, the need for proper monitoring of the local teams' policies in terms of local implementation has not been taken seriously (at least this is the case in Vietnam, especially in 2007 and in 2008). The local teams, of course, have their own reasons and agendas for not cooperating; however, the local and the global levels must work towards the same goals if they are to achieve positive results and outcomes.

The local teams need the global team's input and support. They need to persist in their efforts to introduce new technologies and strategies. The local teams need the knowledge and skills of the global team and their experience in other countries. The global experience should be adapted to the local reality.

In addition to the organizational factors, all the involved parties are important: the global coordinators, the local managers and team members. Unlike many hierarchical, bureaucratic organizations in which the manager or the boss are people who can order others around, HISP should build on cooperation, adequate follow-up, communication and support. These are the core responsibilities of the local manager and the global coordinator, who should motivate the team workers and clearly define the goals to be implemented so as to obtain positive outcomes. However, these aspects were not taken seriously enough in the case of Vietnam (especially in 2007 and in 2008).

The second question: Why did the implementation of DHIS not succeed in the TT Hue Province (2004-2008)? A comparison of the cases of TT Hue Province and HCM City.

The DHIS project failed in TT Hue Province because of the following factors. From the analysis of the project in TT Hue (*see more in chapter 5*), a number of lessons can be learned:

- The first lesson: The needs of the field and the technical capability of the system should be taken into consideration.
 - The second lesson: The technical and the social factors are closely linked. Therefore, solving a technical problem without considering the social consequences is not a good enough solution.
-

- The third lesson: The analysis of the situation in the field, adequate preparations before implementing, and the degree of support after implementation should all be taken into account.

These lessons arise from the implementation process, and refer back to the Gap Closure Techniques (see section 5.4).

If we consider what we have learned, how can the project be improved?

- ***First lesson: The needs of the field and the technical capability***

Based on the findings from the case of HCM City in 2008, a good prototype system is required to provide a functional field system that users can interact with and get adequate feedback from. This strategy did not work for my team, because the prototype that we worked with was cheap, incomplete and difficult to implement. Instead of soliciting the users' approval and cooperation, instead of smoothing the progress of the project, the dysfunction of the pilot system became a *barrier* to implementation on a larger national scale. It would be better to delay/postpone the project until a stable, functional [and customizable] prototype can ensure the success of its implementation.

In our case, the latest versions of the DHIS1.4 and DHIS2.0 were not complete or fully functional, and compromised our project. Stability, reliability and user-friendliness are all key concepts in a pilot project, so when selecting a prototype, we should probably consider the more stable version, the DHIS1.3.

The prototype must be continually monitored and tested by the teams so as to make sure that the basic features of the system are functioning properly. The implementation team also needs regular feedback and comments from the users in order to further update, develop and improve the system. A new version should only be released when it can meet the needs of the field. New and updated technologies are always welcome; however, utility and user-friendliness should remain the top priority.

- ***Second lesson: Technical and social factors***

The technical and social aspects are interwoven into the internal and external structure of the HISP project; i.e., they affect the interaction between the local and the global levels. The technical side of the project can be controlled or managed by the team locally. The social factors, however, seem to suffuse the various fields and their structures and procedures and influence the relations within both the local and global teams. In a HIS/HMIS project, the technical and social factors are of the same importance and should therefore be treated as equal parameters. The project implementers must take the technical and social factors into consideration and do so in light of the field situation.

In the TT Hue case, the social aspects involved the local team, their partner (HueCIT), and the users in the district health units: Hương Trà, Hương Thủy, Phú Lộc, Nam Đông, and Thành phố Huế. They also had an impact on the relations between the local and the global developing teams.

HISP's partner in the TT Hue Province was HueCIT. Instead of being an active local technical support for the local team, the company withdrew from the project after about one year, even though the implementation of the DHIS had not yet produced any positive outcomes.

Why did they withdraw? Why did they lose their enthusiasm? Why had the project lost its attraction?

They lost their enthusiasm because of the way the project stalled (*see 5.5.4: The relations between local team, the field, and global team*), because of their limited capacities and motivation (*see 5.1.2, 5.1.4 and 5.1.6*). The progress of the implantation process was indeed very slow because of the technical problems encountered and because the software was flawed. At the time, the Research and Applications Department (of HueCIT) also had several other local projects requiring their time and attention.

Furthermore, the users of the DHIS prototype system (both 1.4 and 2.0) in the districts lacked basic computer skills and failed to produce reports. They continued to fill in monthly, quarterly, and yearly reports by hand. The manager and the officers from the TT Hue Health Services and the local managers did not believe in the system's potential and promise, or in the utility of the system. They somehow could not see how the system could support and assist their health officers/workers. Their impatience and lack of enthusiasm were contributing factors to the project's failure.

The relations between the local and the global teams were not optimal because of the geographical distance. Also, the local team did nothing to actively deal with the requirements and needs of the users.

The scenario in the south of the country was different from the one in the north. In the south, the staff of the local departments are more proactive and open to change. This can be explained by political and historical factors. Look at the implementation of HISP in HCM City. The local health units and the Health Services of the HCM City are usually inclined to approve development programmes involving computerization and technology as they have fairly open and encouraging policies in this matter. It is reasonably easy for foreign projects and international organizations to gain access to the HCM City administration and to establish their programmes or implement their projects.

When social and political considerations are central to the implementation of a project, it is difficult to impose change. It is therefore important to recognize the signs and act in response to the local conditions.

In view of the passiveness of the local team, a nudge from the global team is sometimes needed to attract the attention of the provincial health department or of the national authorities. In the TT Hue case, a few visits from the global team every year were not enough to garner the attention of the local health authorities and to ensure the support of the local implementation team.

Because of the physical distance between the various levels, online meetings between the local and the global teams were beneficial. Online meetings and discussions are fast and cheap; however, technical and social problems are best solved when meeting face-to-face, especially those associated with the implementation of the DHIS software in the local communities.

- ***Third lesson: be cautious every step of the way***

The implementation plans and strategies belong to the local project team and the local provincial health services. The global team also plays an important role. There are three stages of the implementation process: pre-implementation, implementation, and post-implementation. All of them are equally important. The first phase consists in exploring and studying the field; the second in converting plans into action; and the third in maintaining the installations and assessing the outcomes of the first and second stages.

As regards the TT Hue project, the first two phases were carried out over a period of two years; whereas the third stage was abandoned in late 2007. Without proper maintenance or post-implementation, resistance grew as the system functioned poorly and the implementers could not convince the local authorities to adopt it. This is one of the reasons why the project failed. We see that post-implementation is of decisive importance to the success or failure of a project, at least it was in our project.

Compared with the case of HCM City, the TT Hue Province project failed partly because of how the decisions were made and how the plans were carried out within a HISP framework. The HISP team of the TT Hue Province was not much inclined to build and maintain the product. Because the national team (HISP Vietnam) is located in HCM City, it can support the local project team and the local health center (the Mother and Child Health Care Center).

The TT Hue Province became an almost peripheral ad-hoc HISP project in Vietnam, especially as regards the DHIS2 version. The provincial authorities believed that the DHIS1.3 and DHIS1.4 versions could not work out in TT Hue Province because of the slow progress and the inadequate outcomes. They wanted results fast.

The implementation of the DHIS2.0 in HCM City did not fare much better owing to the problems within the local team (also the HISP Vietnam team). Could it have been tackled in another way? It is difficult to say as long as we have not been given the time and opportunity to solve the problems. If we set up another project with another product, new issues will arise and there is nothing to guarantee success after that. Policies and strategies have their own value – but must be given sufficient time to be tested and amended.

And the lessons learned from the case in HCM City are:

- Monitor the implementation processes more carefully and seriously.
 - Cooperate with your team. The key notions are: transparency, data sharing, cooperation, trust, training, attentiveness, empathy.
-

- Ensure good communication between local, global, and the field teams.

The implementation plan was cancelled in mid September 2008 because of misconceptions about the report system of the Mother and Child Programme. The existing defined data parameters were inadequate and ill-suited to the local needs.

Having talked with doctor Nguyen Hoang Anh Thu (Training collaborator of HISP and trainer of the Center), I saw the problem clearly: two members of the team (TRi+Thuy) discovered that the existing data parameters for the Mother and Child Programmes were faulty. There was a discrepancy between the data collected and the work carried out.

There was also a discrepancy between the monitored and the implemented data.

- The managed data, used to monitor the health status in the administrative area, relied on monthly reports.
- The implemented data relied on quarterly reports.

Usually, the monitored data are larger in scope than the implemented data. So, the teams need more time to redefine the data parameters, data sets, report designs, and so on.

How is the Health data used at the Mother and Child Health Care Center in HCM City?

The Mother and Child Health Care Center in HCM City has two main programmes.

The responsible official for the Child program, Doctor Duong claimed that “no data or indicators are used at the center because the Center is just used as a bridge with administrative functions to collect reports and data from the lower levels, such as districts, hospitals in the city. The information gathered is then distributed to the higher levels, such as the Health department of HCM City”. This information I got from the interview with Dr. Duong.

The responsible officer for the Mother Programme, Mr. Giang replied that “We use indicators. For example: maternal indicators, ratio of pregnancy prevention methods for women and man, etc.” At least, the programme uses indicators.

How can we turn our experience into action? How can the situation improve?

The things that we have learned are things that “everyone knows” and that are easy to recognize. Solving behaviour-related problems need different skills depending upon the specific situation. The roles of the manager of the local team (as a supporter, a collaborator, a motivator, not just a pure manager) must not be underestimated.

The previous chapter (see chapter 2) presented the HISP project as an organization, a programme, and a network. The particular context of HISP in Vietnam has been described. This information about the background helped me understand the problems experienced by the HCM City team, especially the social aspects. As there was not much interference from the global team, decision making seemed to become “local”. The local character of the

problem persisted for two years and had a very negative impact on the whole project and its strategies.

6.2. Compare with the previous studies in Vietnam

My research unveils differences from the previous research, especially as regards the case of the TT Hue province, in which I was involved for about 2 years. I am a Vietnamese and I was a facilitator and a developer of the DHIS within Vietnam. Also, I worked with the DHIS through its three versions: DHIS1.3, DHIS1.4, and DHIS2.0.

My points of view, therefore, are those of an insider, especially with reference to the case of the TT Hue province. My focus has been on the implementation strategies related to the technical and social aspects.

The success and failure of the TT Hue project has been discussed in detail. In HCM City, the HISP is more relevant for development and implementation strategies.

And here is the summary table comparing between the previous and my findings and discussions (see more table 3.3 with detail information for the previous theses, and chapter 5 for my discussions with findings) through the gaps and Gap Closure Techniques:

Closure Techniques	Previous thesis	My findings
The gap: Information	×	Gap is visible!
The gap: Technology	Challenges of team building: infrastructures (Øverland, 2006) The development and use of OSS health care programs: the factor of technological infrastructure (Nguyen, 2007) Implementing challenges: infrastructure (Berg, 2007)	Gap is visible!
The gap: Processes	×	Gap is visible!
The gap: Objective and values	×	Gap is visible!
The gap: Staffing and skills	Local team building and training in HCM city: limits of the interns of the team in learning new technologies, working independently, and English skills (Nordal, 2006) Challenges of team building: capacity and skills of the interns within the team (Øverland, 2006) Implementing challenges: human	Gap is visible!

	resources (Berg, 2007)	
The gap: Other resources (money and time)	Implementing challenges: local commitment in term of funding (Berg, 2007)	Gap is visible!
GCT1: Legitimizing and mapping organizational reality	The development and use of OSS health care programs: the factor of the organizational arrangements (Nguyen, 2007)	Understanding of organizational reality is recommended.
GCT2: Reality-supporting not rationality-imposing applications	The development and use of OSS health care programs: the factor of development processes (Nguyen, 2007) Implementing challenges: local commitment in term of manpower, and support (Berg, 2007)	The benefits of the application for the reality are critical.
GCT4: Change agents	×	The role of the manager of the local team with decisions and strategies for development and implementation is visible. And the relationships between the members and manager of the team should be considered carefully.
GCT6: Participation	Failure of partnership establishment: lack of attention from the partner (e.g. the objectives of the OurSoft partner no more met the approach of HISP). (Nordal, 2006). Challenges of team building: communication and collaboration with the partner university (Øverland, 2006) Documentation as a supporting tool: very useful to the developers in order to learn, share, and follow up within the community. (Store, 2007).	Participation needs to be explored with different dimensions: users, designers, developers, health workers, managers (local, global or health managers) in order to have the whole and lively picture of the reality. So, cooperation and communication within the developers and with the users are emphasized.
GCT7: Hybridization	×	Health officers (users of HISP) need both IT and HIS knowledge.

×: not mentioned

Table 6.2. Comparison tables between the previous these and my findings.

There are many similarities when the gaps and GCT (Gap Closure Techniques) that I found are analysed and compared with those found in previous theses. Some of them are shown in *Table 6.2.2*, for example:

- For the ‘**Staffing and skills**’ gap in Nordal (2006), Øverland (2006), and Berg (2007) theses, relevant factors such as the human resources of the local health units, the computer skills of the interns of the local team, the skills of the health staffs, etc., were mentioned but not discussed in detail. Based on my observations and experience with the HISP project (especially the case in TT Hue Province), I have discussed these factors in detail (*see section 5.1.5*).
- For Gap Closure Technique 1: **Legitimizing and mapping organizational reality**. In Nguyen’s thesis (2007), the organizational reality has been considered whereas mapping the reality into action for implementation has not been included. But my findings (*see section 5.4.1*) put the issues of exploring reality and reacting in a timely fashion in focus.
- For Gap Closure Technique 2: **Reality-supporting not rationality-imposing applications**. In Thanh’s thesis (2007) and Berg’s (2007), the progress of development and local commitment (in terms of manpower and support) were the main factors influencing the field. In my discussion (*see more: 5.4.2*), the utility of the application (e.g. DHIS 1.3, 1.4, and 2.0) becomes relevant when trying to persuade the users to adopt and commit to the software.
- For Gap Closure Technique 6: **Participation**. In Nordal’s thesis (2006), Øverland’s (2006), and Store’s (2007), the participation of and cooperation between the partners (OutSoft company or university) and the developers (both the local and the international HISP network) were in focus. However, based on my findings and experience from the field in Vietnam, I would claim that participation should include more participants with practical and managerial experience, such as health workers, health officers, health managers, managers of the HISP local team, and HISP coordinators.

The problems that I encountered have been thoroughly discussed in my thesis in light of:

- the vantage point and experience of the insiders (the members of the local team) and outsider (me!).
 - my previous working experience and language advantage (because I am a Vietnamese, it’s much easier for me to blend in and to get to know people and collect useful data/information).
 - the District Health Care system, not the Patient-Record System.
 - my approach – a critical analysis of problems related to cooperation and communication (users, developers of the local and global teams, *see more: 5.5*).
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- the 7 gaps and the Gap Closure techniques that I used to explore the Vietnam projects (*see 5.1, 5.2, and 5.4*).

6.3. Possible future research

In such a limited period, the thesis could not cover all aspects pertaining to the subject of the development and implementation of HIS in Vietnam. However, the question raised at the onset of this process, the Success and Failure criteria of a HIS have been discussed in a critical way in the context of TT Hue Province and HCM City, Vietnam, an explanation has been given and a solution has been suggested.

Future research could focus on the development of a sustainable Health Information System model, based on my findings. A model that takes into account what worked and what did not work both on a technical and on an organizational level.

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Town: <http://en.wikipedia.org/wiki/Town>

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Vietnam Health System: http://en.wikipedia.org/wiki/Vietnam_Health_System

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Ward (country subdivision):

http://en.wikipedia.org/wiki/Ward_%28country_subdivision%29

WHO: http://en.wikipedia.org/wiki/World_Health_Organization

WTO: http://en.wikipedia.org/wiki/World_Trade_Organization

Appendix A: Lists

Acronyms and abbreviations

BIRT	Business Intelligence and Reporting Tools
CSCW	Computer Supported Cooperative Work
DHIS	District Health Information System (versions: 1.3, 1.4, and 2.0)
GIS	Graphical Information Systems
HCM	Hồ Chí Minh city
HIS	Health Information System
HISP	Health Information System Programme
HIT	Health Information Technology
HMIS	Health Management Information System
ICT	Information and Communication Technology
IFI	Institutt for informatikk
IT	Information Technology
MCHC	Mother and Child Health Care center
MoH	Ministry of Health
MoU	Memorandum of Understanding
SQL	Structured Query Language
TT Hue	Thừa Thiên Huế
OH	OpenHealth
OS	Open Source
OSS	Open Source Software
UiO	University of Oslo
UNDP	United Nations Development Programme
UNMDG	United Nations Millenium Development Goals
WHO	World Health Organization
WTO	World Trade Organization

***Appendix B: Memorandum between The Planning and Financial
Department of the Ministry of Health, Vietnam and HISP***

Memorandum of Understanding

Between

The Planning and Financial Department of the Ministry of Health, Vietnam

and

The Health Information Systems Program (HISP) and BEANISH, Department of Informatics,

University of Oslo, Norway

**Collaboration on Health Information Systems, Open Source Software development and
capacity building in Vietnam**

Agreement

This is a Memorandum of Understanding (MoU) between the Planning and Financial

Department of Ministry of Health, Vietnam and HISP/BEANISH, University of Oslo,

Norway, to

- 1) collaborate on developing and implementing a Free and Open Source district based Health Information System (DHIS) in Vietnam, and to
- 2) strengthen the capacity in this area and in the area of health information systems more generally in the Ministry of Health and in Vietnam.

The project will work closely with the Ministry of Health and will in an initial phase be implemented and tested out in Ho Chi Minh City, Hue Province, Hanoi City and in other selected provinces.

Given the Vietnamese Government's strategy to move public sector software to open source, the aim is to develop a fully open source software application for the collection, processing, analysis, communication and dissemination of health information in Vietnam. The MoH,

Vietnam, is by this MoU becoming a partner in the open source software development within the HISP and BEANISH comprising a number of countries in Africa, (e.g. South Africa, Botswana, Mozambique, Tanzania, Ethiopia) and Asia (India). The African partners in HISP have come together and formed the BEANISH project under the EU Commission's 6th Framework Program.

Vietnam and the MoH is partner in a proposal submitted to the EU to establish an extension of BEANISH in Asia together with Thailand, India, China and Mongolia.

The HISP network has since 1997 developed the MS Office based District Health Information Software (DHIS 1.4), which is the national standard in South Africa and which is also running in a number of other countries such as India. Building of the knowledge and specifications embedded in the DHIS 1.4, HISP/BEANISH is now developing a fully open source software application based on Java frameworks named DHIS 2.0. This MoU seeks to establish Vietnam and the MoH as a key partner in this development.

The MoH has developed the HMIS, an Access based software application, including the data and reports required by the MoH. In a parallel process HISP-Vietnam has customized the DHIS 1.4 to the conditions in Vietnam and implemented the software in Hue Province and in Ho Chi Minh City. While the strength of the HMIS is that it is fitting to the requirements for data and reporting of the MoH, the strength of the DHIS is its flexibility and capability to analyse and evaluate data. Building on the strength of both applications, the first step in the project, the pilot phase, is to merge the HMIS and the DHIS and gradually include the Open Source modules as they are finalized, before finally the whole application is fully Open Source. This work will be carried out in Hanoi City, Hue and HCMC and other selected pilot provinces. As a step 2, after evaluation and acceptance, the fully open source DHIS 2.0 will be implemented countrywide. The following is an outline of the two steps (see figure):

STEP 1: Merge the HMIS and the DHIS 1.4 in a combined and integrated software application suit. This will be carried out in selected pilot provinces and cities. The independent modules of the open source project will be added and integrated with the merged application as they are being finalized. Examples of such modules are; report generator, webpresentation of information and reports, map based Geographical Information System (GIS). When the Open Source DHIS 2.0 is ready it will gradually replace the merged HMIS/DHIS application. Then follows evaluation.

STEP 2: When the DHIS 2.0 is ready, tested and evaluated it will be implemented country wide. DHIS 2.0 will include a number of other modules and functionalities, such as webbased user interface for data entry and access to data, information and data analysis. However, given the fact that many parts of Vietnam will have insufficient band-width and connectivity, DHIS 2.0 will allow for a mixture of stand-alone and web-based applications.

Support from HISP/BEANISH:

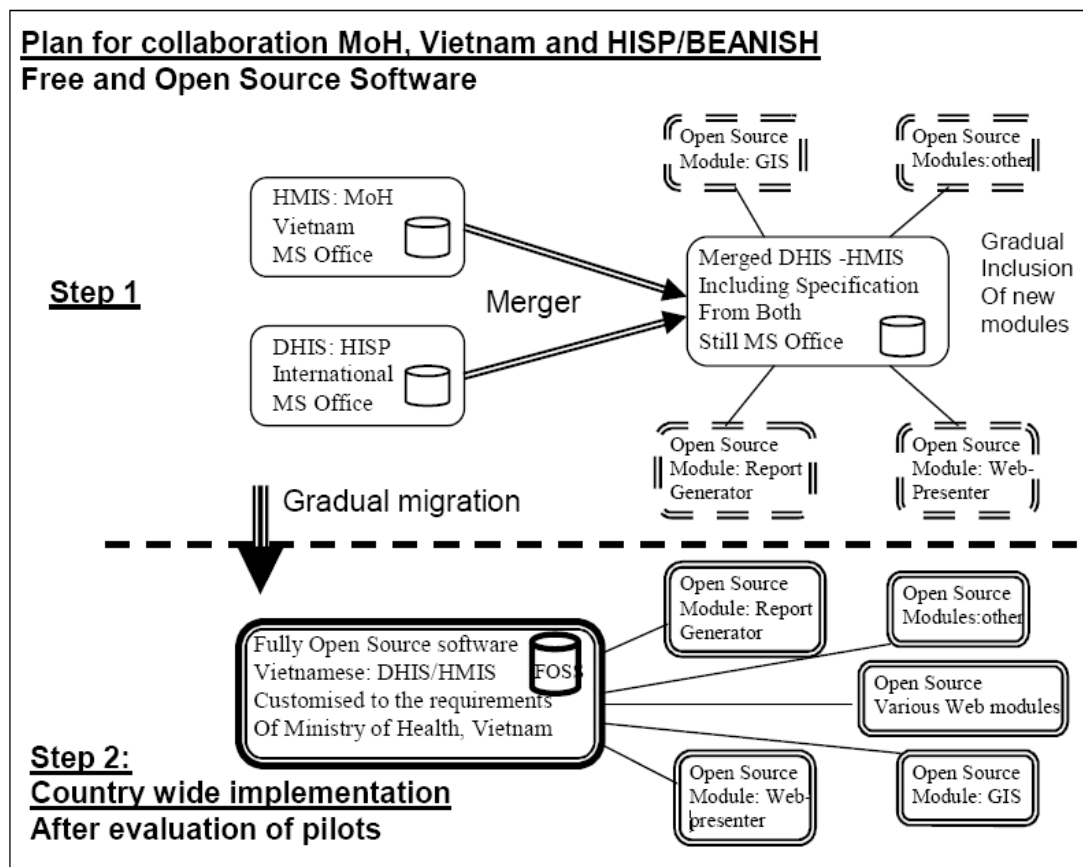
HISP/BEANISH will support MoH in developing strong capacity in health information systems and open source software development by Employ one person who will work for the MoH in Hanoi. This person will work on the HMIS/DHIS merged software application and support the implementation of this software first in Hanoi City and thereafter in other provinces. This person will be trained by HISP and work closely with the team in HCMC and Hue.

Support capacity development and training of staff at the MoH working on the HMIS/DHIS and open source development.

Develop project proposals together with the MoH for additional resources to the project. The BEANISH Asia proposal submitted to the EU is part of this work.

Support the work in the pilot provinces and cities.

Support the country wide implementation of the Vietnamese Open Source Health Information Software Application DHIS 2.0.



Signature.....Date: 7 November 2005

Dr. Duong Huy Lieu , Director, Planning and Financial Department, Ministry of Health, Vietnam

Signature.....Date: 7 November 2005

Associate Professor Jorn Braa, Department of Informatics, University of Oslo, Norway.

Coordinator of HISP/BEANISH

Appendix C: Agreement between Health service of Thua Thien Hue province, OutsoftHue, and the HISP project

Background

The Health Information Systems Programme (HISP) is active in a number of countries, and is committed to facilitate the introduction of computer based information systems for reporting and analysis at the district level and below, and to enhance the use of public health care data at all levels. A major part of the project involves the development of a tried and tested open source software package called the District Health Information System (DHIS). The newest version of this software is called 1.4, and runs on a Microsoft Office platform, as that is something most health care users have access to and know. A new, Java based version is also under intense development in Vietnam and elsewhere, and will be completely platform independent and free.

The DHIS has been running in pilot phase in a limited number of health care units in Ho Chi Minh City and in Hue since end of 2004. In agreement with the health authorities in these provinces, the pilot will be expanded in the third quarter of 2005, with the aim to go into full production by the end of 2005.

Hue

As of February 2005, the DHIS 1.3 version is running as a pilot in two districts in Hue, one urban and one rural. The two districts are facing some problems, both places the database disappeared due to problems with MS Office service releases. These problems are now fixed and in both pilots the system is being improved and prepared for the next implementation phase. The health service of Thua Thien Hue is very committed in this work. In order to realize the full value of the system, this must be expanded to all 9 districts as soon as possible, transitioning to the improved 1.4 version. OutsoftHue has generously offered their technical and managerial expertise to assist in the development of both the overall public health information system for Hue province and directly with the open source software.

Responsibilities

Health service of Thua Thien Hue Health service, in particular the statistical division, has successfully established the organizational hierarchy, essential data elements and required reports in the current version of the DHIS, and introduced it in two districts. The commitment will have to be expanded in the next phase:

- The health service will nominate a person as their project manager, to ensure progress and proper coordination with all the sites in Hue, as well as with the HISP project in other provinces and in Oslo.
 - The health service will commit to hire a full time person who will take care of technical matters related to the development and running of the DHIS system and
-

hardware. HISP will support the health service with the salary of this person and a computer. She comes from Informatics Department, Hue College of Sciences and will start working in this position from June 1st 2005.

- The health service will provide sufficiently powerful computer systems for the remaining 7 districts, including printers for the production of local reports.
- The health service will assign persons in all districts, who will be responsible for data entry, report production and training locally. These persons will be given sufficient time for training in and management of the system.

OutsoftHue

OutsoftHue have played a crucial role in the development of a computerized health care information system for Hue in the first part of the pilot phase, and will continue to be an essential partner in the next phase. Both the transition to the 1.4 version and the expansion to all 9 districts in Hue will require extensive technical and information system support to the health services.

- OutsoftHue will provide thorough training in both basic computer skills and in the DHIS system for all staff selected by the health services to work with the DHIS in all districts, and continue to provide technical support to all the districts.
- OutsoftHue will provide one full time person who will ensure the progress of the expansion of the DHIS system to all Hue districts and manage the transition to the 1.4 version. This person must go to HCMC for one week of training in the 1.4 version in April 2005.
- OutsoftHue will send one Java developer to take part in the development of the 2.0 version of DHIS with the HISP team at TMA Solutions in HCMC for a period of four months, starting in the end of February 2005.
- OutsoftHue will provide working space and internet connection for one Master student from the University of Oslo, and one student from Hue University of Science and Technology.
- OutsoftHue will provide support from a person with strong English language skills who can assist with the translation of the new version of the software, as well as other documents and act as an interpreter when the need arises. This person will also keep the <http://www.hisp.info/Confluence> web site updated as far as activities in Hue are concerned.
- OutsoftHue will make available all necessary GIS data for Thua Thien Hue province, to enable the reports and analysis in the DHIS system to be complemented by maps.

- OutsoftHue and the HISP project would like to collaborate on open source development. The scope of this needs to be determined, but there should be one developer assigned as responsible for the collaboration.

HISP

- HISP will provide the open source software free of charge, and commits to tailor the next version of the software to the needs of the Thua Thien Hue Health service.
- HISP will provide training and support for the Thua Thien Hue Health service both by visits from project coordinators and postgraduate students who carry out field studies in Vietnam.
- HISP will cover the travel expenses to HCMC for the two people from OutsoftHue mentioned above.
- The HISP project will provide facilities for networking and remote support through such means as email, mailing lists and on-line documentation.
- HISP will provide advanced technical training in open source technologies and frameworks for students and developers taking part in the development of the new version.
- HISP has provided two computer systems for Hue province. These are completely under the supervision of the Health service of TT-Hue province.
- HISP will provide the salary, a computer and office equipment for the technical person working at the health service as mentioned above.

Hue, 14 March 2005

Dr. Nguyen Dung

Dr. Le Viet Dung

Ola HodneTitlestad

Health Service TT-Hue

OutsoftHue HISP

Univ. of Oslo

Appendix D: Memorandum between Health Department of TT Hue and HISP

Memorandum of Understanding

between

The Hue Province Health Department, Vietnam

and

The Health Information Systems Program (HISP), Department of Informatics, University of
Oslo, Norway

Collaboration on Health Information Systems, Open Source Software development and capacity building in Hue province

Agreement

This is a Memorandum of Understanding (MoU) between the Hue Province Health Department and HISP, University of Oslo, to collaborate on developing and implementing a district based Health Information System (HIS) in Hue Province.

TMA Solutions, Ho Chi Minh City, and Huesoft, Hue are HISP partners in the project. The project in Hue Province will be carried out in collaboration with a similar project in Ho Chi Minh City. The project in Hue Province aims to contribute to national development through collaboration with the Vietnam's Ministry of Health.

The Open Source District Health Information Software (DHIS), developed by HISP in South Africa, will be adapted and customised according to the needs and requirements of the Hue

Province. The DHIS software will be implemented in all 9 district offices and in the Hue Province Health Department. The system will capture, manage and provide analysis and reports from the data reported routinely by the wards and health units to the districts. The data is reported on paper formats from the wards and health units to the district offices where it is entered in the DHIS software. From the district the data is reported to the Hue Province

Health Department on electronic formats using e-mail. Data can also be reported using discs.

At the Hue Provincial Department of Health the provincial database will be maintained.

The project will revise the reporting forms and integrate the information between all health programs. Today the health units are reporting similar data to several offices at district level.

The aim is to integrate this fragmented reporting structure by creating a unified and integrated district database.

In addition to the routine health data the databases at district and province levels will also contain other types of data such as population and census data, and data on infrastructure and personnel.

The system is flexible and extendable. When more health units (e.g. hospitals) get computers, the software can also be implemented and used locally, and report on electronic format to the district.

The DHIS software is a tool for health managers and workers to analyse their own data and customise reports so that information can be used for planning, monitoring, management and general support of the health services.

Project organisation and responsibilities

The project will be based at the Hue Province Health Department where 3 staff members will be allocated to work in the project. Duong Phan Bich Hai (engineer) will be responsible at the Hue Province. In addition 2 staff members from health management: the Mother and Child Health and Preventative Health programmes will be members of the team. Integration of the information from all health programs is a priority. In each district a team of 2-3 people will be formed, one person responsible for statistics and computer and one or two from health management. The province level team is responsible for training the district teams.

The Hue Province Health Department is responsible for the technical infrastructure. The project will implement the system on the computers and network that is being planned and currently implemented in the districts in Hue Province.

Revising data standards, reporting formats and routines are important parts of the software development and implementation process. HISP will assist the Hue Province Health Department in this work.

The HISP team, consisting of Huesoft, TMA Solution and the University of Oslo, will develop, adapt and maintain the DHIS software and assist the Hue Department of Health in implementing the project.

The DHIS software is developed by the international HISP network and is Open Source and provided free of costs. HISP is responsible for the software and its implementation and will assist in the training and facilitation.

Training

Training and capacity development are critical components of the implementation and need to be carried out at three levels:

- a) The Hue Province Health Department IT unit needs to be able to run, maintain and “trouble shoot” the system once it is implemented. This capacity will be developed by ensuring strong participation from the Hue Province Health Department in all stages of software adaptation and implementation.
- b) Training of staff responsible for the system at district level. A minimum of two people from each district needs to undergo training in basic system running and maintenance as well as in managing the information, making reports etc.
- c) In addition to the basic technical capacity to run the system training will also need to address analysis and use of information for management and health services delivery.

Project plan

The project will be implemented in 3 phases. At the end of each phase a more detailed plan for the next phase will be developed.

Phase 1: Pilot. 20 October 2004 – February 2005

Define and set up database based on routine reporting formats:

Revise the data sets to be used in the first database version

Organise the population / demographic data to be included in the database

Identify the key indicators to be included in the database

Define the key reports to be produced by the system

Implement the system in the Hue Province Health Department, Hue City and Huong Thuy District

Phase 2: Implementation. March – December 2005.

Implement the system in the remaining 7 Districts of Hue Province. Train all district teams.

Based on the experienced gained the software will be further developed on a continuous basis.

The aim is to get the data collection and reporting part of the system working in all districts at the end of this phase.

Phase 3: Consolidate the system and improve the use of information. January – December 2006.

This phase will focus on analysis and use of information for management and health services delivery. Health management at district and province level will be trained on how they can use the system to analyse data and make customised reports.

The staff responsible for the system in the district will be trained on analysing data and making reports.

Background: the Health Information Systems Programme (HISP)

HISP is an international research and development network. Starting in South Africa in 1994, HISP has since 1999 developed into an international network including Mozambique, Malawi, Tanzania, India and Ethiopia. Vietnam is now being included as a partner in the HISP network.

The Open Source DHIS software was first developed in South Africa and has been implemented in all districts and hospitals in that country since 1999. DHIS is now in various stages of adaptation, testing and implementation in a number of other countries. A major

HISP objective is to build a strong network of Open Source Software development between developing countries. Vietnam will be an important contributor to this network.

The core research and development and ‘networking’ activities in HISP are funded through the Norwegian Government. In each country participating in HISP additional funding for development, implementation and educational programmes have been obtained from various sources such as international donors and local health authorities.

Signature.....Date.....

Dr. Nguyen Duc Hue, Director, Hue Province Health Department

Signature.....Date.....

Associate Professor Jorn Braa, Department of Informatics, University of Oslo, Norway.
Coordinator of HISP

Appendix E: Agreement between Health department of HCM city and HISP

Agreement

between

The Ho Chi Minh City Health Department, Vietnam

and

The Health Information Systems Program (HISP), Department of Informatics, University of
Oslo, Norway

Collaboration on Health Information Systems and Open Source Software development and capacity building in Ho Chi Minh City

Agreement

This is an agreement between the Ho Chi Minh City Health Department and HISP, University of Oslo, to collaborate on developing and implementing a district based Health Information System (HIS) in Ho Chi Minh City. All 24 districts in HCMC will be targeted and Mother and Child Health data will be the first area of intervention.

HISP will further develop and adapt the Open Source District Health Information Software (DHIS) to suite the needs of HCMC Health department and implement DHIS in all the districts in HCMC. The HCMC Health Department will participate in this task by allocating staff from the informatics unit to work with the development team.

Revising data standards, reporting formats and routines are important parts of the software development and implementation process. HISP will assist the HCMC health Department in this work. The HCMC Health Department allocates health program managers and other relevant personnel to take part in this work.

Training and capacity development are critical component of the implementation and need to be carried out at three levels:

- a) The HCMC informatics unit needs to be able to run, maintain and “trouble shoot” the system once it is implemented. This capacity will be developed by ensuring strong participation from the HCMC Health Department’s Informatics unit in all stages of software adaptation and implementation.
- b) Training of staff responsible for the system at district level. A minimum of two people from each district needs to undergo training in basic system running and maintenance as well as in managing the information, making reports etc. This needs to be organised as training courses. The HCMC Health Department will organise the courses and HISP will conduct the training.
- c) In addition to the basic technical capacity to run the system training will also need to address analysis and use of information for management and health services delivery. This will need to be done in collaboration with a health educational institution, such as the Ho Chi Minh City Medical Staff Training Centre.

Organisation – project team

The project is based at the HCMC Health department and the project team consists of representatives from the Health department; the Informatics unit, health management and 2-3 districts, and from HISP; both from Norway and local partners.

Contributions from HISP

The DHIS is developed by the international HISP network and is Open Source and provided free of costs.

Development and adaptation of the DHIS software in Vietnam is carried out by HISP in collaboration with TMA Solutions which is one of the Vietnamese HISP partners. This work is also provided free of costs. The BAKCO Company is also expected to take part in this work.

HISP has some basic funding through the Norwegian Government and the Norwegian participation in the project will be free of costs for the HCMC Health Department. HISP is responsible for software, implementation and to conduct the training.

Contributions from the HCMC Health Department

The HCMC Health Department will allocate staff from the Informatics unit, health management and districts to the project team.

The HCMC Health Department is responsible for organising the training sessions (venues, participants, equipment) when the system is to be implemented in all districts.

The HCMC Health Department is responsible for the technical infrastructure. The project will implement the system on the computers and network that is being planned and currently implemented in the districts in HCMC.

Tentative plan for the first phase

The project starts in October 2004. During 2004 the project will

- establish the project group
- develop a plan
- revise the data sets on Mother and Child Health to be used in the first database version
- organise the population / demographic data to be included in the database
- identify the key indicators to be included in the database
- define the key reports to be produced by the system
- based on the above, develop a first DHIS database application based on conditions and needs in HCMC and test it in a few districts
- during October: write a more detailed plan

Background: the Health Information Systems Programme (HISP)

HISP is an international research and development programme established as collaboration between health authorities and universities in a number of countries. Starting in South Africa in 1994, HISP has since 1999 developed into an international network including Mozambique, Malawi, Tanzania, India and Ethiopia. Vietnam is now being included as a partner in the HISP network.

The Open Source DHIS software was first developed in South Africa and has been implemented in all districts and hospitals in that country since 1999. The national implementation in South Africa was funded by USAID. The achievements and strong resource base in South Africa have been important for building the international HISP network and the work in other countries. DHIS is now in various stages of adaptation, testing

and implementation in a number of other countries. A major HISP objective is to build a strong network of Open Source Software development between developing countries.

Vietnam will be an important contributor to this network.

The core research and development and ‘networking’ activities in HISP are funded through the Norwegian Government (NUFU/NORAD). In each country participating in HISP additional funding for development, implementation and educational programmes have been obtained from various sources such as international donors and local health authorities.

Development in HCMC and in Vietnam

Collaboration with the Vietnamese National Department of Health in the project is important and the project in HCMC aims to contribute to national development.

Signature.....Date.....

Dr. Le Truong Giang, HoChiMinh City Health Department.

Signature.....Date.....

Associate Professor Jorn Braa, Department of Informatics, University of Oslo, Norway.

Coordinator of HISP

Appendix F: Agreement between Health Service of Thua Thien-Hue province, and the HISP project

Background

The Health Information Systems Programme (HISP) is active in a number of countries, and is committed to facilitate the introduction of computer based information systems for reporting and analysis at the district level and below, and to enhance the use of public health care data at all levels. The HISP project in Hue was initiated in November 2004 and since then the software and routines for computerization have been piloted in first two districts, and then since March 2006 in five of the totally nine districts.

The HISP project provides a flexible open source software package, the DHIS, to support reporting and analysis of health information. This software has been co-developed and customized to the Vietnamese context by the HISP Vietnam teams in HCMC and Hue.

The software being used is a previous version of the DHIS; the MS Access based DHIS 1.4 and the next step in the project should be to upgrade to the newly released version 2.0. Following a successful software upgrade process the plan is to extend the project's scope to include all 15 statistical reports (B1-B15), and to involve all nine districts over the next 1,5 years. To support this expansion, the HISP Vietnam project would like to strengthen the HISP team in Hue with more technical staff. This agreement outlines how this upgrade and the expansion process will take place and how responsibilities will be shared among the two collaborating parties.

Timeline and action plan

September 15 2006:

Finish upgrade to DHIS 2, including database, reports and pivot tables for analysis. This first deliverable will include five (B1, B9, B10, B11, B12) of the 15 reports of the statistical health information system.

This system will be implemented in the five pilot districts during September. The data from the remaining four districts will be reported using the traditional paper forms from district to province and registered electronically at the province level to ensure full provincial coverage of the data (B1, B9, B10, B11, and B12).

December 15 2006:

Extend the data scope to include electronic reporting of all 15 (B1-B15) reports from the five pilot districts.

April 2007:

Extend the geographical scope to include totally seven districts.

July 2007:

Extend the geographical scope to include all nine districts.

December 2007:

All districts should by then report all 15 reports (B1-B15) electronically to the province level.

Responsibilities

TT Hue

- The health service will assign persons in all districts, who will be responsible for
-

data entry, report production and training locally. These persons will be given sufficient time for training in and management of the system.

- The health service will provide sufficiently powerful computer systems for the remaining 4 districts, including printers for the production of local reports.
- The health service is responsible for supplying working place for Norwegian members of HISP Team in Health Service of TT Hue.

HISP

- HISP will provide the DHIS 2.0 software customized to support the T.T. Hue Health Service and the Statistical Division's HIS (B1-B15).
- HISP will continue to support running project implementation costs with a monthly contribution of 1.500.000 VND until the end of 2007.
- HISP will continue to support the salary of our employee in Hue until the end of 2007. She provides technical support to the project.
- HISP will dedicate one of the HCMC-based developers to work for the project in Hue. He will be based in HCMC and support software development from there, but visit Hue when necessary.
- Two Norwegian developers will be based in Hue from August-November 2006 to support the DHIS 2.0 upgrade process.
- The support for computerization process in the five pilot districts, HISP will provide 1 new computer and 1 printer to Nam Dong district and 1 printer to Huong Thuy district.

Dr. Nguyen Dung

Health Service TT-Hue

Dr. Duong Dinh Cong

HISP Vietnam

Ola Hodne Titlestad

Univ. of Oslo

Appendix G: Agreement for the employment of Ms. Vo Thi Kim Anh in the TT Hue HISP project

Responsibilities

As stated in the collaboration agreement between TT Hue Health Service, HueCIT and HISP dated March 14 2005, the Health service of TT Hue will hire Vo Thi Kim Anh from June 2005 as a fulltime technical person to support HISP activities in TT Hue. The Health Service is responsible for providing office space for Ms. Kim Anh. As stated in the agreement, HISP will support the Health Service of TT Hue with the salary of Ms. Kim Anh, as well as a computer and office equipment for Ms. Kim Anh.

Contract

The Health Service of TT Hue is the employer of Ms. Vo Thi Kim Anh and therefore the employment contract must be between these two parties. As HISP is responsible for covering the salary, we suggest that the contract is signed for a one year project engagement with possibilities for prolongation. HISP guarantees for the salary of 2.000.000 VND/month for 12 months from June 2005 to May 2006, as mentioned with possibilities for further support, based on the status of the project.

Job description

This position is a fulltime position in the HISP project and all job responsibilities must be related to this project. Ms. Kim Anh will work in the Hue HISP team lead by Ms. Duong Phan Bich Hai of the TT Hue Health Service. Thus, Ms. Kim Anh should report to Ms. Hai.

There are three main tasks for this position:

1. Support the implementation of DHIS in TT Hue.
2. Participate in the software development of DHIS 2.0.
3. Support intern students from the University of Hue working in the HISP project

In order for the HISP coordinators to supervise Kim Anh on these tasks and to follow up the HISP project in TT Hue, HISP requests that Kim Anh write weekly reports on her work and send by e-mail to Knut Staring (knutst@ifi.uio.no) and Ola Hodne Titlestad (olati@ifi.uio.no). Note that this job description is not final and can if necessary be changed by the HISP coordinators to reflect the status of the project. Here is a more detailed description of each of the three tasks:

Task 1 Implementation of DHIS

Ms. Kim Anh will be in charge of the technical support for the implementation of the DHIS software in the province. HISP will supervise in this task and support via e-mail and visits to Hue. Furthermore, HueCIT is through the agreement of March 14 2005 committed to support the implementation process with technical expertise and Ms. Dang Thi Tuyet Nhung at HueCIT is the person appointed for this task. Therefore, Ms. Kim Anh must work closely with Ms. Nhung in the implementation process. More specifically, the implementation consists of the following subtasks:

1. Adapt the DHIS software to meet the requirements and needs of the TT Hue Health Service.
2. Install and maintain (fix problems, update with changes to database or new releases) the DHIS in all health offices where the software will be used in the province.
3. Give technical support to the users of DHIS in the province, both concerning DHIS specific problems and hardware problems.
4. Train the appointed health personnel in the use of DHIS.
5. Follow up the training and use of DHIS in the provincial and district offices with frequent (as much as needed) visits.

Task 2 Software development of DHIS 2.0

A new version of the DHIS, version 2.0 is under development and will be a fully open source software package based on java technologies. This version will gradually be put in production by combining new java-based 2.0 modules with DHIS version 1.4. Especially the new modules for reporting and analysis are relevant to run in combination with 1.4. The HISP team in TT Hue has so far played a central role in developing a report module for DHIS 2.0 and an important task for Ms. Kim Anh is to continue this work. Kim Anh will take part in further development of the report modules for DHIS 2.0, and test and modify these modules so that they, as soon as possible, can be put in production in TT Hue. More specifically, the subtasks for this software development are:

1. Continue the work on the report module
2. Participate in the development of additional report modules for DHIS 2.0
3. Collaborate with other DHIS 2.0 developers at HueCIT, in India, Norway and possibly other countries in the HISP network.
4. Follow the standardized way of software development defined by the DHIS 2.0 coordinators:
 - a. Document the development process at the HISP Confluence wiki
 - b. Use the JIRA tool for project management and bug tracking

- c. Commit your code frequently to the HISP subversion server
- d. Use the mailing lists and the wiki for communication with other DHIS 2.0 developers

Task 3 Support intern students

Ms. Kim Anh is responsible for supporting the intern students from University of Hue that work in the HISP project. The intern students normally participate in both implementation and software development and in order to get started with this work they need training in both the current version of the DHIS that is being implemented, as well as in java technologies needed for participating in the DHIS 2.0 development. More specifically, subtask for intern support are:

- 1. Train interns in the current version of the DHIS software
- 2. Train interns in the health information system of TT Hue Health Service
- 3. Train interns in the java technologies and tools needed for DHIS 2.0 development
- 4. Make sure that the interns are actively engaged in the HISP project and have concrete work tasks throughout their internship.

Prof. Nguyen Dung, MD, Ph.D

Vo Thi Kim Anh

Ola Hodne Titlestad

Director of Health Service TT-Hue

HISP collaborator

HISP, Univ. of Oslo

Appendix H: Implementation PLAN for SOFTWARE DHIS 2.0 (of HISP program)

I. Content implementation:

- 1. Introduce the "Software information system Health" version - DHIS2.0.◇
- 2. Installation guide use the software, instructions enter the◇ report data for statistical reporting of Form 1, 9, 10, 11, 12 by the Ministry of Health for the district.
- 3. Check the implementation of software for the statistics reported◇ in the pilot districts: Hue, Huong Thuy, Huong Tra, Phu Loc.

II. Members:

Ba. Vo Thi Kim Anh – Employee of HISP Project in Hue.
Ma. student Eivind Berg – Student from University Oslo - Norway.
Ma. student Margrethe Store – Student from University Oslo - Norway.

III. Time and location:
Huong Tra district, HUE.

Friday- 27/10/2006, time: 8:30 am TTYT

Sign
Vo Thi Kim Anh

Appendix I: MINUTES (Dec 23rd 2008) of HISP Vietnam and Can Tho Health Department

SOCIALIST REPUBLIC OF VIETNAM

Independence - Freedom - Happiness

MINUTES

Discussion between Can Tho Department Of Health (DOH) and HISP Vietnam team about data aggregate methods.

Time : 8:00AM - 11:00AM December 23rd, 2008

Location : Meeting room - Can Tho DOH - 71 St. Ly Tu Trong, Can Tho city, Vietnam

Participants :

- Mr. Dao Quang Huy - Officer of Information System Statitic Department, Ministry of Health
- Dr. Duong Dinh Cong - Professor of Pham Ngoc Thach Public Medic University.
- Mr. Giao - Officer of Statitic Department. Can Tho DOH.
- Dr. Quang - Deputy chief of Can Tho health bureau

- Mr. Nguyen Phuoc Minh - Network Administrator of Can Tho DOH
- Mr. Nguyen Quoc Tuan - Phong Dien Health Center
- Mr. Ngo Van Giai - Head Of Phong Dien Health bureau.
- Ms. Nguyen Thi Cuc - Cai Rang Health Center
- Ms. Huynh Cam Tu - Cai Rang Health Center
- HISP Vietnam Team - Mr. Nguyen Ngoc Thanh, Mr. Tran Thanh Tri, Mr. Dao Van Sam, Mr. Dang Duy Hieu, Ms. Nguyen Tran Do Xuan Thuy.

Meeting objects

1. Discussion and Learning about dataelement relations between 7 standard report models of ward and 15 standard report models of district and nationality.
2. Unifying data collecting methods of ward level according to the time.
3. Means of reporting
4. Training plan.
5. Other Expressings of participants

Meeting details

1. Discussion and Learning about dataelement relations between 7 standard report models of ward and 15 standard report models of district and nationality.
 - Aggregate data same as Mr. Huy trained for a few state data elements
 - Aggregate data according to the guide book of MOH.
 - Assign permissions for report generating would be according to the real cases.
 2. Unifying data collecting methods of ward level according to the time.
 - Collect data according to 7 standard report models. This is the core of works.
 - Collect data monthly.
 - For some data seldom changes, collect yearly or set data value as permanent.
 - For state datalements, collect quarterly.
 - After finish the collecting above data, modify the program to collect data to serve another types of upper level reports.
 - 6th, 8th standard reports won't be entered at ward level but district level. 15th model will import data from the report file of hospitals.
-

- Human resource report will be entered at district level.
- 3. Means of reporting
- 4. Training plan.
- 5. Other Expressings of participants
 - Mr. Huy : was assigned to watch for HISP VN team develop the Health Information System(HIS) by Mr. Lieu. With many experiences about implementing HIS and after identify the program's advantages and benifics, Mr. Huy wishes Can Tho organization unit will combind closely with HISP team to get good result of DHIS implementation research program. HISP team will watch for and push the program implementation, and later will transfer the technology to apply in other provinces later.
 - Mr. Quang :
 - Request the program not only implement on main reports but also serves on other relate reports to help the officers in reporting operation.
 - The officers of DOH will support for the team and the ward officers in the implementation.
 - Due to low knowledge about IT of ward level staffs, so Mr. Quang request the IT training and data enter training from the HISP team.

Conclusion

The meeting was conducted in accordance with the content discussed above.

But the 3. and 4. objects are delayed to the next meeting.

Date 23/12/2008

Person created minutes

Nguyen Tran Do Xuan Thuy

Appendix J: MINUTES (April 2nd 2009) of HISP Vietnam meeting

SOCIALIST REPUBLIC OF VIETNAM

Independence – Freedom – Happiness

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MINUTES

Vietnam DHIS 's meeting on April 2nd, 2009

Time: from 10:00 am to 12:00 am, April 2nd, 2009.

Location: DHIS office in Reproductive Health Care center.

Participants: Mr. Tri, Mr. Hieu, Mr. Sam, Ms. Tran and Ms. Thuy.

Meeting agenda

1. Discussion about global plan.
2. Discussion about DHIS project personnel .
3. Assigning responsibilities for employees.
4. Planning of employees self-training

Results of meeting

1. **Discussion about global plan.**

Global strategy, the team suggested, first of all, to concentrate in developing the DHIS2.0 and in implementing of DHIS2.0 in Can tho and HCM city.

- **Plans for Ho Chi Minh city**

- **DHIS2**

- Mother Health Report program: there was mother health data of July, August and September 2008. Prepare plan for implementing DHIS2.0 in 2 districts of HCMC (Binh Thanh district and district 4), and plan to aggregate these data and

generate reports to show in one seminar with HCMC Health Department in July.

- Children Health Report program: this program needs to be implemented in 24 districts, plan to generate child health indicators in order to show in July.
- Children Report Record program: this program is being implemented at this Reproductive Health Care center; it needs to be maintained and develop this software to cover some more mother health's elements. Ms. Tran will work directly with Dr. Trung in this concrete job.
- Responsibility: Ms. Thuy and Ms. Tran.
- **Plan for Can Tho city**
 - Trained for Cai Rang and Phong Dien district users. Mr. Sam will plan for support users in Phong Dien district after training.
 - Need to hire a person in Phong Dien or Cai Rang district to undertake supporting and monitoring the reporting of users in Cai Rang and Phong Dien district till late June, 2009.
 - Then the plan will expand to other rural districts (from July to December) after that the project would be ratified by Can Tho city DOH.
 - Responsibility: Mr. Tri and Mr. Sam.
- **Plan of applying DHIS2 for City/Province Health Departments**
 - Find out city Health Department Report models, could be from MOH (Mr Huy)
 - Plan to apply DHIS2 for this report system
 - Responsibility: Mr. Hieu.
- **Plan for improvement the working conditions**
 - Upgrade the system for office.
 - Network: Plan to register new and strong internet line as well as get a static IP for server because currently our office is sharing internet service with Reproductive Health Care center, and internet connection is depended on the center and not stable.

- Domain: plan to buy a new domain for users friendly and introduce the system to users.
- Upgrade RAM for server more 2 GB RAM. The current server is using 2GB RAM.
- Hire a service man to set up the network of system as well as server.
- Responsibility: Mr. Tri and Mr Sam.
- Upgrade the employees' computer : plan to upgrade Tri and Hieu laptop, buy a new one for Thuy.
- Plan to rearrange our office

2. Discussion about about DHIS project personnel.

- We all recognize after many year, DHIS team in HCM city didn't achieve any concrete objectives and our work to develop and to implement is not simple; especially when we try to carry out the whole reporting system (from ward/commune to district and so on).
- So we need more personnel, who has to work for DHIS; that's why, about the idea to invite Ms. Tran to work with the DHIS Vietnam team; after discussion and writing each opinion (anonymous papers), the result is 100% of us would like to have Ms Chau Thu Tran in our team (these anonymous papers were checked by Dr Cong and Dr Trung after the meeting).

4. Assign responsibilities for employees.

- Programs in Ho Chi Minh city : Ms. Tran and Ms. Thuy.
- Programs in Can Tho city : Mr. Tri and Mr. Sam.
- Program for MOH : Mr. Hieu
- Follow up DHIS plans in Can Tho and HCM city: Mr. Sam and Ms. Thuy.
- Create the provide fee report of upgrading the system and employees' machines : Mr Tri and Mr. Sam.

5. Self-training of employees

- Suggest that every employee should have self-training for their knowledge of the software and network to work well in office.
-

- Mr. Sam should learn more about network to manage system in office.
- New members should learn and practice more about DHIS
- Each member should have one subject to study long-term and prepare to write papers or to present in HISP meeting.
- Responsibility: Ms Tran with the support of Dr Cong.

Conclusion

The meeting was conducted in accordance with the content discussed above.

Date April 2nd, 2009

Person created minutes

Nguyen Tran Do Xuan Thuy

Appendix K: Cooperation between Center Health Care reproductive of HCM city and Development Health Information System

PROJECT RESEARCH AND DEVELOPMENT OF APPLICATION SOFTWARE
REPORT Electronics' Information Systems Health districts "
(DHIS2 - District Health Information System version 2)

COOPERATION BETWEEN

Center Health Care reproductive Ho Chi Minh city
And

DEVELOPMENT HEALTH INFORMATION SYSTEM - CONTACT Sciences-Tehnology
Association of Vietnam

Research purpose built test models of high medical statistics from the remote access to the

districts to the City may look to expand. Project principal science and technology based education information on open source and support experience of technical project DHIS International University of Oslo Norway.

Name:

Research building and application software pilot electronic reporting "system health information districts - DHIS2"

Researching:

This is a research project with two forms of research

1. Basic research: software development DHIS;
2. Applied research: implementation of the DHIS in districts.

Belonging to the

Information and health information - open source.

The objective of the research:

- 1) Research and Development, Localization software report electronic (online) "information systems medical districts - DHIS2.0;
- 2) Research applications software electronic reporting program for DHIS2.0 SKBM first county at 2 districts (from wards, communes to districts);
- 3) applied research report software electronic (online) "information systems medical districts - DHIS2 SKTE for the program;
- 4) Research and Development software metrics gathered from each child for Child Health Care plan ; then first to incorporating metric subsidiary of pregnancy.
- 5) The study applied two software above system for reporting medical electronic level districts to city (Mother and Child Health Care Ccenter, Ho Chi Minh City);
- 6) Training and staff health statistics - information and support capacity building decisions by management staff health

Duration:

Expected duration is 1.5 years (18 months) from the project was signed.

However, then the project will be to continue receiving new funding for the purpose of applying for health plans in the Ho Chi Minh City.

The participation of research

The research of cooperation among the following:

- 1) Care Center reproductive health for participation research and development for the districts ...;
- 2) Center to develop information systems of medicine Medical Association KHKT Vietnam for research information;

The research is being directed the Department of Health and city and consult University of

Oslo - Norway:

- 1) TS. BS. Le Truong Giang Deputy Director, Department of Health and GS. Jorn Braa Oslo University guide the research;
- 2) GS. Jorn Braa, University of Oslo, Norway.

Main activities:

- 1) Development of Vietnam and the software reports statistics health (DHIS2.0) in accordance with requirements of the Center reproductive health care products st. City.
Time from 3 / 2009 to 5 / 2009
- 2) Development of software to collect, manage metrics child health, then continue to research incorporating metric subsidiary Thai health;
Time from 3 / 2009 to 12/2009 in
- 3) Deployment DHIS2.0 for the health of mothers in District 4 and Binh Thanh;
Time from 4 months in 2009 to 6 / 2009
- 4) Deployment DHIS2.0 in all districts for the health of children;
Time from 4 months in 2009 to 6 / 2009
- 5) Set the health of essential software DHIS2.0 for the medical management;
From 5 / month in 2009 to 6 / 2009
- 6) Building materials and training;
Time from 3 / 2009 to 5 / 2009
- 7) organize training courses and guidance to use the software for the districts;
Time from 3 / 2009 to 12/2009 in
- 8) Track and evaluate results of implementation;
Duration 6 months, 12/2009
- 9) The conference presented research results.
7 months time, 12 / 2009

Expected results (outputs) of research

- 1) Software DHIS2.0 (version 2.0) for the reporting of metrics CT. SKSS;
- 2) Management Software metrics health child health and pregnancy secondary;

3) teaching material, guidance to use software and software instructions;

4) network and SKTE SKBM CT in 24 districts have the knowledge and skills applied in DHIS2.0 reporting metrics.

Cost of research

The cost of the research reserve is about 23,900 USD

Cost is for the expenditure:

- rental costs on the specialist construction software
- 1 MA. BS. General management USD 100 x 18 months 1800 USD
- 2 Professional on 2 x 400 x 18 months U.S. \$ 14,400 USD
- 1 staff on TT.CSSKSS by 50 months x 18 USD 900 USD

- The cost of open training

o 5 layers x 100 USD 500 USD

- travel costs for implementing districts

o 18 months x USD 100 USD 1800

- The cost for the office, telephone, electricity, water

o 150 x 18 months U.S. \$ 2700 USD

- The cost for on-site management

o U.S. \$ 100 x 18 months 1800 USD

Total: 23,900 USD

MA. Ngo Quoc Chinh

Vice Director of Mother and Child Health Care Centr

Ph.d. Doctor. Duong Dinh Cong

Development Information Health System

MA. Doctor Le Truong Giang

Vice -manager of Health Department of Mother and Child Health Care Center, HCM city

THỰC HIỆN CÔNG TÁC KẾ HOẠCH HÓA GIA ĐÌNH
Báo cáo 3, 6, 9, 12 tháng

TT	Cơ sở y tế	Tổng số PN 14-49 thực hiện BPTT	Số PN đặt dụng cụ tử cung		Số triệt sản Nam		Số triệt sản Nữ		Sử dụng BCS	Số dùng thuốc tránh thai			Các BP khác	Số hút điều hòa kinh nguyệt	Số nạo thai	Số phá thai to	Xây thai tự nhiên	Các trường hợp tai biến trong kế hoạch hóa gia đình			
			Cũ còn tác dụng	Số mới	Cũ còn tác dụng	Số mới	Cũ còn tác dụng	Số mới		Thuốc uống	Thuốc tiêm	Thuốc khác						Do đặt vòng	Do dùng thuốc	Do triệt sản	Do nạo phá thai
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	Tổng số	850	2077	884	4	12	12	27	4557	3703	441	20	0	5	0	0	1	0	0	0	0
	II. Tuyến Quận/Huyện	0	0	0	0	0	0	0	2604	2811	272	0	0	0	0	0	0	0	0	0	0
1	TT YTDPCái Răng								2604	2811	272										
2	BV đa khoa Cái Răng																				
	III. Tuyến Phường/Xã	850	2077	884	4	12	12	27	1953	892	169	20	0	5	0	0	1	0	0	0	0
1	Phường Lê Bình	831	318	45			9	9	738	382	39	7									
2	Phường Hưng Phú	19	281	300	4	4	3	3	476	475	43			4							
3	Phường Hưng Thạnh								12												
4	Phường Ba Láng																				
5	Phường Phú Thử			164		5		4	38	35	3	10		1							
6	Phường Thương Thạnh		1478	212		2		7	372		51	3				1					
7	Phường Tân Phú			163		1		4	317		33										

(source: www.ytct.gov.vn:9000/dhis)

Appendix N: An example with the report 12: Treatment and Health Services, with prototype data from PhongDien district, Can Tho city in 2009

CÔNG TÁC KHÁM CHỮA BỆNH VÀ DỊCH VỤ Y TẾ
Báo cáo 3, 6, 9, 12 tháng

TT	Cơ sở y tế	Số lần khám bệnh		Số BN nội trú		Số BN Ngoại trú		Tổng số BN chuyển tuyến	Tổng số ngày điều trị nội trú	TS BN chết tại cơ sở y tế	Số lần xét nghiệm	Số lần chụp X Quang	Số lần chụp cắt lớp (CT Scanner)	Số lần làm siêu âm	Tổng số phẫu thuật			Tổng số thủ thuật
		Tổng số	Tr.đó khám ngoài viện	Tổng số	Tr.đó YHDT	Tổng số	Tr.đó YHDT								Loại A	Loại B	Loại C	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	Tổng số	28342	0	121	500	0	884	19	117	0	0	0	0	0	0	0	0	0
	II. Tuyến Quận/Huyện	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	BVĐK Phong Điện																	
2	TT YTDPC Phong Điện																	
3	PKĐK Khu vực Phong Điện																	
	III. Tuyến Phường/Xã	28342	0	121	500	0	884	19	117	0	0	0	0	0	0	0	0	0
1	Xã Tân Thới	6341		4				2	12									
2	Thị trấn Phong Điện	730																
3	Xã Giai Xuân	2161			189			4										
4	Xã Nhơn Nghĩa	7109		4	311		311											
5	Xã Nhơn Ai	4759					212											
6	Xã Trường Long	4152		113				6	75									
7	Xã Mỹ Khánh	3090					361	7	30									

(source: www.ytct.gov.vn:9000/dhis)